NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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FOR RELEASE: Tuesday, 4:00 p.m.
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RELEASE NO. 60-135

CLARK T. RANDT APPOINTED DIRECTOR, OFFICE OF LIFE SCIENCES

Dr. Clark T. Randt has been appointed Director of the new Office of Life Sciences of the National Aeronautics and Space Administration, T. Keith Glennan, Administrator, announced today. Dr. Randt was formerly NASA Scientist for Space Medical Research.

The Office of Life Sciences forms the fifth major division of NASA covering the fields of biology, medicine, and psychology. (The other divisions within NASA are the offices of: Space Flight Programs, Launch Vehicle Programs, Advanced Research Programs, and Business Administration.)

In establishing the office, Dr. Glennan followed the recommendation of NASA's Bioscience Advisory Committee, chaired by Seymour S. Kety, Chief of the Laboratory of Clinical Science, National Institute of Mental Health at Bethesda, Maryland. (See NASA Release 59-204) The committee was formed last July to recommend long-range plans concerning research and development in U.S. space-related life sciences.

The committee recommended that in view of NASA's responsibility for all space research and development devoted to peaceful purposes, the agency should undertake a vigorous program in the life sciences as an integral part of the national space program. It further recommended that NASA make the fullest possible use of existing aeromedical facilities operated by the military services, while at the same time developing in-house capability for research peculiar to its own programs in manned space flight and basic biologic research. The committee specifically recommended that NASA establish a life sciences research center.

In its report to Dr. Glennan, the committee emphasized two objectives of space research in the life sciences: to provide for research, development, and training in the scientific and technologic aspects of manned space flight; and to investigate fundamental biological problems relative to space environments, including the search for extraterrestrial life.

In addition to establishment of the Office of Life Sciences at the program directorate level, the Bioscience Advisory Committee recommended:

1) That the office be staffed with assistant directors for basic biology, applied medicine and biology, medical and behavioral sciences, and the life sciences extramural program -- sponsored research in universities, other government agencies, and industry. 2) That a NASA facility be established to conduct research in the space-oriented life sciences. 3) That outside consultants be appointed to advisory committees. 4) That NASA's program be coordinated with work in the life sciences conducted by the military services and other government agencies. 5) That provisions be made for training and education in the form of fellowships, training grants, etc. 6) That the program should emphasize exchange of information within the scientific community. 7) That security regulations should be employed only when national security is clearly involved. 8) That life sciences facilities established by NASA should be made

available to implement both U.S. and international cooperative efforts.

Dr. Randt, for the past year, has assisted in evaluating the space-related life sciences personnel, facilities, and programs in the military services, universities, and industry as Executive Secretary of the Bioscience Advisory Committee. He is a member of the Armed Forces-National Research Council Committee on Bioastronautics and the Bioastronautics Advisory Group for the Defense Department's Discoverer program, and serves as a NASA liaison representative to the Space Science Board of the National Academy of Sciences.

Born in Lakewood, Ohio, in 1917, Dr. Randt was graduated from Colgate University and earned his medical degree from Western Reserve University in 1943. After training in internal medicine at the University Hospitals of Cleveland, military psychiatry at the U.S. Army Psychiatric Center, Brentwood, Long Island, and neurology at the Neurological Institute of New York, Columbia Presbyterian Medical Center, he joined the faculty of the School of Medicine, Western Reserve University in 1950. He became Associate Professor of Neurology there in 1952 and was appointed Director of the Division of Neurology at the University Hospitals of Cleveland in 1956. He joined the NASA staff in July 1959.

The author of numerous medical articles, Dr. Randt has made fundamental contributions in sensory neurophysiology and understanding of the effects of anesthesia on the brain. His current research has been concentrated in sensory deprivation, particularly in the areas of weightlessness, isolation, and confinement. He is a member of a number of scientific societies.

Dr. and Mrs. Randt, the former Mary Louise Mitchell, and their three sons have made their home at 21300 Claythorne Road, Shaker Heights, Ohio.

- END -

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

FOR RELEASE UPON DELIVERY
(Expected at 10:00 a.m.
March 8, 1960)

Statement by

Dr. T. Keith Glennan, Administrator

National Aeronautics and Space Administration

before the

House Committee on Science and Astronautics

March 8, 1960

Mr. Chairman and members of the Committee:

I welcome this opportunity to discuss the President's proposed amendments to the National Aeronautics and Space Act of 1958 which were submitted in a special message to the Congress on January 14, 1960.

In proposing these amendments for Congressional enactment, the President is taking cognizance of NASA's coming of age after a very active transitional period during which our capabilities have been developed and expanded and our goals have come more sharply into focus. The amendments are a natural evolution based upon operating experience under the present law.

Principally, the amendments would accomplish the following:

1) Make clear NASA's unequivocal responsibility for planning and carrying out the Nation's space exploration program;

2) Eliminate presently unnecessary organizational elements;

3) Provide adequate safeguards against unnecessary duplication of effort by NASA and the Department of Defense,

particularly in the costly field of launch vehicle development; and

4) Provide for a clearer realization, both in this country and throughout the world, that the United States has a single space exploration program administered by NASA. Such military operations in the space environment as may be necessary for our national defense devolve from the responsibilities of the Defense Department for the defense of the Nation and clearly must be managed by the Department of Defense.

The Space Act, as you know, requires that the President supervise a so-called "comprehensive" program. In no other aspect of Government does the Chief Executive have such an immediate degree of responsibility for an operating program.

To assist the President in these duties, the Act presently provides him with an advisory body, the National Aeronautics and Space Council, of which he is Chairman. The 1958 legislation also set up a Civilian-Military Liaison Committee to provide a channel through which NASA and the Defense Department shall "advise and consult" on all matters within their respective jurisdictions as they relate to aeronautics and space.

Under the original Act, and under the Act as the President has recommended that it be changed, only two Government agencies have management responsibility in the area of space activities -- NASA and the Department of Defense. Numerous other agencies contribute vital elements to both NASA and Defense projects. When all the nondecision-making bodies with which we deal are reduced to a chart, the resultant tangle of boxes and dotted lines gives an impression of confusion and divided authority, but such is not the case. Only NASA and the Defense Department have clear management responsibilities.

I have emphasized this last point because there has been considerable misunderstanding and criticism of the Government for having "too many fingers in the space pie."

Let me here quote the President's message of January 14:

"... In actual practice, a single civil-military (space) program does not exist and is, in fact, unattainable; and the statutory concept of such a program has caused confusion. The military utilization of space, and the research and development directed toward that end, are integral parts of the total defense program of the United States.

"... The Department of Defense has ample authority outside the ... Act ... to conduct research and development work on space-related weapons systems and to utilize space for defense purposes; and nothing in the Act should derogate from that authority ..."

Pointing out that we have come to the end of a formative period during which responsibility for a broad range of space activities shifted, as authorized in the Act, from Defense to NASA, the President said:

"From now on it should be made clear that NASA, like the Department of Defense in the military field, is responsible in the first instance for the formulation and execution of its own program, subject, of course, to the authority and direction of the President."

With repeal, therefore, of the specific statutory enumeration of the President's duties, he consequently requests abolition of the National Aeronautics and Space Council which had the sole duty of advising him on those duties. He also calls for abolition of the Civilian-Military Liaison Committee which has, in practice, served as only one of many channels of communication between NASA and the Pentagon. In order to coordinate activities and prevent duplication of effort and expense, it is imperative that NASA-Defense liaison be conducted at many levels. The attempt to formalize this need and center the activity in one committee has proven to be an unnecessary, cumbersome, and unworkable mechanism.

The Act would retain the provision that in case of serious disagreement between NASA and Defense over roles and missions, use of launch vehicles or whatever, the NASA Administrator and the Secretary of Defense would take them to the President for his final decision.

In the single most important area requiring coordination between NASA and Defense, the President requests that the Act embody a procedure whereby he assigns responsibility for development of new launch vehicles -- regardless of which agency has the prime requirement for their use in space missions.

In this connection, as you know, the President sent a second message on January 14, advising the Congress of his intention to transfer the Development Operations Division of the Army Ballistic Missile Agency to NASA along with Saturn, the super booster under development by the Division, it being clear that there is no immediate military mission for such a launch vehicle. We have been encouraged by the prompt action of this Committee and the House of Representatives in endorsing this transfer.

By way of summary: If enacted, the proposed amendments would make absolutely clear NASA's responsibility for the Nation's space exploration program and eliminate the present specific statutory duties of the Chief Executive in this regard. The NASA would be clearly answerable to the President and the Congress, just as the Defense Department has unquestioned responsibility for defense-related space activities and also is responsible to the President and the Congress.

NASA and Defense will continue, as at present, to cooperate closely at all levels. Undoubtedly, each program will continue to produce hardware, techniques, and scientific data useful to the other.

The President's requested amendments also include such technical changes as modification of certain provisions of the Act concerning invention property rights. The modification of the patent clauses in the legislation would give NASA adequate discretionary authority concerning an equitable disposition of property rights relating to inventions produced under NASA contracts. The President has included several other proposals which will place NASA on parity with the Defense Department in dealing with contractors and in other business activities.

As you consider these amendments, I would like to review briefly with you the course of events since the evening of October 4, 1957, when the news of Sputnik I burst upon the world. More than two years have passed since that evening but we are still conscious of the turmoil that followed in its wake.

Sputnik arrived in the middle of an annual domestic crisis: the World Series. And while some of our citizens remained momentarily more interested in the trajectory of a baseball than in the satellite's orbital flight, the Soviet accomplishment hit most thinking Americans like a dash of cold water.

The Nation began a re-examination of U.S. science, defense, education, and foreign policy that is still going strong. Out of this ferment of Congressional hearings and national debate came the firm resolve of both the Executive and Legislative Branches that a civil agency should be established to conduct the Nation's space exploration program.

The President appointed Dr. James R. Killian as his Special Assistant for Science and Technology and as Chairman of his Science Advisory Committee. This distinguished group prepared the first general outlines of a national space program and listed the following four factors involved therein:

"The first of these factors is the compelling urge of man to explore and to discover, the thrust of curiosity that leads men to try to go where no one has gone before...

"Second, there is the defense objective for the development of space technology. We wish to be sure that space is not used to endanger our security. If space is used for military purposes, we must be prepared to use space to defend ourselves.

"Third, there is the factor of national prestige. To be strong and bold in space technology will enhance the prestige of the United States among the peoples of the world and create added confidence in our scientific, technological, industrial, and military strength.

"Fourth, space technology affords new opportunities for scientific observation and experiment which will add to our knowledge and understanding of the earth, the solar system, and the universe ..."

In early April 1958, the President sent a special message to the Congress calling for a civilian space agency. After hearings and debate, the National Aeronautics and Space Act of 1958 was enacted in July and NASA became officially operative on October 1.

The existing Act states that "it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind." It calls upon NASA, in Section 203, to "plan, direct, and conduct aeronautical and space activities," these being defined in Section 103 as: 1) "research into, and the solution of, problems of flight within and outside the earth's atmosphere;" 2)"the development, construction, testing and operation for research purposes of aeronautical and space vehicles;" and 3) "such other activities as may be required for the exploration of space."

Of the three objectives, only the third is unique to NASA, for the National Advisory Committee for Aeronautics and the Armed Services were engaged in the first two activities before the creation of NASA.

The exploration of space, then, is NASA's specific mission, and it is a mission for which it is solely and exclusively responsible under the law. This is a responsibility just as unique to NASA as the military defense of the Nation is to the Armed Services. It is a mission of vital importance to the security interests of the United States.

To provide the newborn agency with the capability to fulfill its mission, the Act gave the President authority to transfer to NASA from Defense, projects and organizations which he deemed to be important to the fulfillment of that mission.

You are all familiar with NASA's absorption of NACA and with the transfers of other important activities immediately following establishment of NASA. With the acquisition of the Development Operations Division of the Army Ballistic Missile Agency, NASA will have developed an all-around space capability.

The consolidation of the U.S. space exploration program under NASA has greatly clarified the civilian and defense roles in space. Projects and personnel have been dropping into place like the pieces in a puzzle.

The law as originally enacted permitted and encouraged these actions which have had the support of the Congress. The administrative machinery to accomplish this purpose has served well the intention of its authors. Looking ahead to the heavy and continuing responsibilities which face the Nation in this highly competitive field, the President is proposing a straightforward legislative change that gives to NASA the task of meeting these responsibilities.

I respectifully urge the prompt enactment of these amendments.

With me today are several colleagues who will attempt, as will I, to answer any questions you may have.

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No. 60-138

STATEMENT OF GEORGE M. LOW

CHIEF, MANNED SPACE FLIGHT PROGRAMS, NASA

before

HOUSE COMMITTEE ON SCIENCE AND ASTRONAUTICS

Mr. Chairman, Members of the Committee:

The subject of my discussion today is Project Mercury.

As you may recall from my presentation to this Committee last year, Project Mercury represents this nation's effort to launch and recover a manned satellite. The program's primary objective is to study man's capabilities in a space environment.

The project was conceived, and is being carried out, in a manner that will attempt to achieve manned orbital flight at an early date.

Let me now briefly review some of the basic principles involved in this project. My first slide is an external view of the satellite, or capsule, in which the man rides. When it is launched from earth, it sits on top of an Atlas vehicle with the small end pointed up. Affixed to the blunt end of the capsule is a retrograde and separation rocket package. This package contains small solid propellant rockets, used first to separate the capsule from the launching vehicle, and later on to initiate the descent of the capsule from its satellite orbit. An emergency escape rocket mounted on top of a tower-like structure serves the function of separating and carrying the capsule from the booster, should it malfunction during the launching.

BALLISTIC CAPSULE

The next slide shows a cut-away view of the satellite capsule, revealing some of its engineering details. The shape of the capsule proper was dictated by heating and stability considerations during its reentry into the earth's atmosphere.

When the capsule returns to the atmosphere, the large blunt end will be facing forward; the heat of reentry will be dissipated by a plastic heat shield.

Within the pressure-tight capsule, the Astronaut is supported in a form-fitting couch. During a normal reentry, he is pressed back into his couch with eight times the force of gravity. Centrifuge tests have demonstrated that in such a couch, man can withstand higher g-forces than he will encounter in flight.

An environmental control system will maintain the cabin's atmosphere within prescribed limits; and a communication system will telemeter important data to ground stations in addition to permitting voice communications between the pilot and the ground.

The capsule's attitude will be sensed with the aid of infrared horizon scanners, and it will be stabilized with small reaction jets which can turn the capsule about its pitch, yaw, and roll axes. These jets can be controlled either automatically, or with a manual attitude controller. For manual control, the pilot will get an indication of the capsule's orientation from flight instruments or through a periscope.

Descent from orbit is initiated by firing the retrorockets, which slow the capsule by only 350 miles an hour. This is just enough so that the earth's gravity will slowly pull the capsule toward the atmosphere.

After the capsule enters the atmosphere, it will be slowed down by the drag of the air through which it flies, from nearly orbital speed of 17,500 miles per hour to a speed of only 200 miles per hour. Then, at an altitude of 10,000 feet, a large parachute is deployed to lower the capsule into the Atlantic Ocean. This parachute, and a second reserve parachute, is housed at the small end of the capsule.

Pictorially, this sketch indicates that the capsule is a relatively simple vehicle; but such is not the case. It has been a major engineering task to design a satellite that can withstand the heat and forces of launch and reentry, and yet is light enough to be boosted into orbit. The design of reliable subsystems, sufficiently small to fit within the six-foot diameter capsule, has stretch the existing state-of-the-art. The complexity of the device is perhaps best illustrated by the fact that seven miles of electrical wiring are interwoven into the capsule, in order to control the many valves, rockets, explosive bolts, and electronic systems.

There has been a great deal of discussion concerning the role to be played by the pilot in a space mission. We are firmly convinced that this role should be a very active on, and that the reliability of all systems will be greatly enhanced through the capabilities of the Astronaut.

The extent of pilot participation in the Mercury operation is illustrated with the aid of a picture of the pilot's instrument panel, shown on the next slide.

The sequence controls, on the panel to the left of center, allow the pilot to back up essentially every function that is normally performed automatically in the flight sequence. For example, if the retrorockets do not fire at the proper time, the Astronaut can fire them by pushing the proper button.

On the extreme left panel are the switches used to lock out the automatic attitude control system, and to activate the manual control system. Then, by using the manual control stick, together with the flight instruments, the pilot can maintain the capsule in the proper orientation.

Another handle on the lef-hand panel allows the Astronaut to decompress the capsule, in case there is a fire or a build-up of toxic gases. Venting the capsule to the outside vacuum will extinguish a fire or remove noxious gases. A second handle is provided for re-pressurization.

The panel on the right contains instruments and switches for the control of the life-support, electrical and communications systems; and warning lights that indicate the malfunctioning of any of these systems.

The entire array of instruments illustrates that the Astronaut's participation in the Mercury mission will be very extensive.

RESEARCH AND DEVELOPMENT PROGRAM

A project as complex as Mercury could not be carried out without an extensive research and development program. At the end of my presentation, I will show a film describing the tests conducted during the past year. But before I show the film, I would like to discuss the plans for future flight tests.

REDSTONE BALLISTIC FLIGHTS

During 1960, flight tests will be conducted with the production Mercury capsules, manufactured by McDonnell Aircraft Corporation. A very important series of ballistic flights will be made, using the Redstone vehicle.

The flight path, or trajectory, for these Redstone flights is illustrated on the next slide. The Redstone will carry the capsule to an altitude of 125 miles, and to a distance of 200 miles from Cape Canaveral. The flight will last only 16-1/2 minutes. During that time, the capsule will be accelerated to a speed of 4,000 miles an hour and will withstand g-forces as high as 6-1/2 during exit, and 11 during reentry. A weightless time of 5-1/2 minutes will be sustained.

Thus, the Redstone flights will permit a thorough qualification of the Mercury capsule and its systems under the loads of launching and reentry; the altitude will be sufficiently high to subject all systems to a space environment during a period of weightless flight.

Initally, the Redstone boosted capsules will contain only instruments. Later on, a capsule containing a chimpanzee will be flown along the same trajectory.
And, when we are convinced

all systems are sufficiently reliable, manned ballistic flights will be made. In these flights, man will be subjected to more than five times the period of weightlessness than had heretofore been possible. The experience gained by the Astronaut in the operation of the capsule in these relatively short flights, we believe, will be exceedingly valuable as part of the training program for the later manned orbital flights.

ATLAS BALLISTIC FLIGHTS

Capsule qualification at speeds higher than those possible with the Redstone will be carried out with the Atlas. As illustrated on the next slide, the Atlas will launch the Mercury capsule along a series of ballistic trajectories before it is employed in the orbital mission. All of the Atlas ballistic flights will be unmanned.

The first type of trajectory, shown by the yellow line, will give the worst possible reentry conditions that could be attained in an aborted orbital mission. In this flight, the capsule will plunge steeply back into the atmosphere after reaching an altitude of 140 miles. A peak deceleration of 19-g will be encountered during reentry.

The trajectory of the next Atlas ballistic flight, indicated by the red line, will be shaped to duplicate exactly the velocity, altitude and angle of orbital reentry without actually going into a satellite orbit. The primary objectives of this flight will be to qualify the capsule and its heat protection under actual reentry conditions; and to determine the stability characteristics of the capsule and the functioning of the reaction control system.

The third type of ballistic flight is illustrated by the blue line. In this flight, the capsule will actually be inserted into orbit but will immediately be turned around and a reentry will be executed. During this flight an altitude of 120 miles will be reached and a range of 4000 miles will be attained. In addition to providing complete qualification of the capsule and all of its systems, this flight will give the necessary operational experience needed before orbital flights can be attempted. This will include experience in ground handling, launch and orbital insertion, the retrograde maneuver, tracking and computing, and search and recovery operations.

ORBITAL FLIGHTS

After completion of the ballistic flight test program, the capsule and its launch vehicle will be ready for the first orbital flight.

My next slide shows some of the conditions to be expected in orbital flight. The altitude of the orbit will be 120 miles and the velocity 17,500 miles per hour. Each orbit will last about 90 minutes. It is planned to keep the capsule aloft for three orbits, or 4-1/2 hours.

The first time the Mercury capsule is sent into orbit, it will contain only instruments so that the functioning of all the equipment can be checked. Later on, a capsule containing an animal will be flown to check the life-support system, the biological instrumentation on board, and to determine the physiological effects of long-term exposure to weightless flight.

Only after successful instrumented and animal flights have been completed will the first manned flight take place.

Some of the operational procedures to be followed in the orbital flights are shown on the next slide. The capsule will be launched from Cape Canaveral in a direction toward Bermuda. The shaded areas on the map illustrate the planned recovery areas. Ships and aircraft will be deployed in all of these areas in order to effect the recovery at the earliest possible time.

The ships deployed along the initial flight path, between Florida and the Canary Islands, will be used to retrieve the capsule in case of an aborted flight. If there are indications on the ground (or in the capsule) during the early stages of flight, that for some reason it would be impossible to complete one orbit, then immediate action to terminate the flight will be taken. The capsule would then be brought down within one of five discreet landing areas in the Atlantic Ocean.

Emergency landing areas also are provided after completion of the first and second orbits.

While in orbit, the capsule's flight will be monitored by a world-wide network of tracking and communications stations. A description of the location and function of these stations will be given in a subsequent presentation.

At the completion of the third orbit, the capsule's retrograde rockets will be fired near the California coast. The capsule will then slowly descend toward the atmosphere, re-enter the atmosphere, and land in the Atlantic Ocean.

The entire flight will have lasted only 4-1/2 hours. A modern jet transport airplane that left Los Angeles at the time the manned satellite was launched, would just be arriving in New York. Yet the Astronaut will have circumnavigated the globe three times -- a total distance of 75,000 miles.

FLIGHT SCHEDULE

The Mercury flight schedule is shown on the next slide. This schedule lists flights of the Little Joe vehicle, which is used in the Mercury development program, and of the Redstone and Atlas vehicles. The first Little Joe booster was launched in October 1959 and three additional vehicles were launched in November and December 1959 and January 1960, respectively. It is planned to launch an additional Little Joe using a McDonnell production capsule during the first half of this year. Redstone flights will start in the middle of calendar year 1960 and will continue for perhaps one year.

In September 1959, a Mercury developmental capsule was launched with an Atlas booster in the first major flight in the Mercury program. Atlas ballistic flights with McDonnell capsules will commence during the second half of calendar year 1960. After a series of ballistic flights have been completed, instrumented capsules and capsules containing animals will be flown into a satellite orbit; and finally, the first manned orbital flight will take place.

PROGRESS TO DATE

I will now show a motion picture to present some of the accomplishments of the past year.

This film is in three parts. First, a brief review of the research and development program that is such an important part of Project Mercury, will be given. Next, some of the Mercury Astronaut's activities will be shown. And finally, the film will describe the progress made in the manufacture of the Mercury capsule. May I now have the film, please.

- FILM -

PROGRAM COSTS

We have attempted to illustrate some of the many difficult tasks that confront us in a project of this magnitude. The funds required to carry out this program are listed on the last slide.

The major expenditures are incurred in the procurement of boosters and capsules, and in the tracking network and recovery operations. For Fiscal Year 1961, we are requesting $107,750,000.

- END -

GML:lgs
1-29-60

FOR RELEASE UPON PRESENTATION
Expected 10 a.m. March 10, 1960

Statement by

Franklyn W. Phillips, Assistant to the Administrator

National Aeronautics and Space Administration

before the

House Committee on Science and Astronautics

March 10, 1960

Mr. Chairman and members of the Committee:

It is a pleasure for me to have this opportunity to discuss with you today the operation of the National Aeronautics and Space Council. The functioning of this Council has been the basis for much conjecture and I want you to know that I fully appreciate your desire for information which can be used as a basis for appropriate changes in the Aeronautics and Space Act of 1958.

As you have been advised I have very recently been relieved as Acting Secretary of the Council and this position is now held by Mr. David Z. Beckler in the Office of the Special Assistant to the President for Science and Technology. However, I served as Acting Secretary of the Council from January 1959 to February 1960 and prior to that time was intimately familiar with its operation. My statement, therefor, is made from this vantage point.

As Acting Secretary of the Council, I was responsible to its members, to perform whatever functions they required in prosecution of the Council's business. There were, of course, certain specific responsibilities assigned to me.

I was responsible for arranging meetings, formulating agendas in consultation with the members of the Council, preparing and distributing appropriate material, and recording actions taken at Council meetings.

The staff of the Council, those engaged exclusively in work for the Council, was comprised of myself and my secretary. There were, in the offices of each of the Council's members, staff people responsive to my needs, and I had free access to call on them for whatever assistance I required.

Including the first and organizational meeting of the Council on September 24, 1958, it has met a total of eight times. All of these meetings were chaired by the President as required by the Act. In addition to these regular meetings, there have been eight so-called "informal" meetings attended by Council members or their representatives. The purpose of these "informal" meetings has been to sharpen the issues that were, at a later date, to be presented to the President.

It is important to note here that the Council's function is to advise the President in the performance of his duties as prescribed in Section 201 (e) of The Act. Although these duties call upon the President to perform certain planning and management functions, the Council remains in an advisory capacity and has no management functions in its own right.

The membership of the Council is an illustrious one drawn from government and private life and it provided broadly-based policy advice on such matters as transfers of projects and facilities to the National Aeronautics and Space Administration, international co-operation including U. S. participation in United Nations' space activities, a national space vehicle program, assignment of national priorities, long range plans for the Nation's space program, relationship of U. S. and Soviet space programs, and the organization and operation of the Nation's tracking and other ground support facilities.

The Council has performed a useful function during the early transitional period during which the Nation's space program was being organized. Now that the program has reached a state of maturity, the need for detailed management by the President and the need for his advisory Council is less obvious.

Now, Mr. Chairman, I will be glad to try to answer whatever questions the Committee has.

# # # #

No. 60-141

Successfully Fired 3/11/60

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

Postponed Mar. 10

HOLD FOR RELEASE
UNTIL LAUNCHED

No. 1
March 8, 1960

Fueling difficulties

PAYLOAD

This United States launching will attempt to place a 90-pound "planet" in orbit around the Sun between Earth and its inboard planetary neighbor, Venus.

If the Thor-Able booster performs as programmed, the spherical 26-inch payload will have a 295-day "year" in its journey around the Sun.

The beachball-sized aluminum package carries five prime scientific experiments, among them a 150-watt output transmitter designed to permit communications between Earth and payload at distances of up to 50 million miles. The transmitter is believed to be the most powerful ever flown in deep space -- roughly 20 times more powerful than any U. S. experimental space transmitter to date.

Longest previous contact Pioneer IV 407,000 miles

The same spacecraft had been scheduled for a mid-December launching but was "scrubbed" 36 hours before launch time due to electronic component failures. The trouble was traced to converters, units which amplify or modify a given voltage to make it acceptable for a payload circuit. Since then the payload has undergone a thorough re-evaluation and has passed a variety of additional vibration and space environment tests, as well as extensive checkout procedures.

The launch is the third in a series of "paddlewheel" payload flights. They include Explorer VI, launched August 7, 1959, into a highly elliptical Earth orbit, and an Atlas-Able space probe which failed 45 seconds after launch on November 26, 1959, when its nose fairing broke away prematurely.

NASA contracted for the series in November, 1958, with the Air Force Ballistic Missile Division (ARDC). In turn, AFBMD subcontracted with Space Technology Laboratories, Inc., of Los Angeles, with STL providing overall system integration and payload packaging. In all, some 50 subcontractors, including universities and companies, have had a part in the series.

The Thor-Able booster in this launch is 90 feet tall, the same three-stage rocket combination that powered Explorer VI into a 26,400 by 157-mile Earth orbit. This time the booster will have to propel the payload 3,000 miles an hour faster than Explorer VI -- or about 25,000 miles an hour at third stage burnout -- if the probe is to get into its planned orbit.

The extra velocity will be obtained by regulating the rocket engines to burn a few seconds longer than in the Explorer VI launch and by reducing the payload weight.

Explorer VI weighed 142 pounds; the probe, 90 pounds.

This probe carries no "kick" rocket or hydrazine engine, as did Explorer VI and the Atlas-Able package, respectively. The reason is the probe's mission doesn't require any velocity step-ups or slow-downs; if it has the initial velocity it needs, the probe will do its job. The probe experiments are much the same as those on the earlier two paddlewheel payloads only there are fewer of them because of the weight limitation.

The probe is designed to describe a 506-million-mile path around the Sun. Its trajectory should carry it to the Earth's orbit at aphelion (greatest distance from the Sun). At perihelion (closest distance to the Sun), it should briefly intersect Venus' orbit.

Would it impact Venus or Earth? Not for more than a million years in the case of Venus, the astronomers say. And in the case of Earth, not for roughly 100,000 years. If it ever did get close to Earth, the probe would be burned up on re-entry just as are Earth satellites which fall back into the Earth's atmosphere.

The reason behind the longer odds on a Venus impact is that the probe's plane would differ slightly from that of Venus. Also the probe's orbital speed around the Sun would be different from that of both Venus and Earth: 71,500 miles an hour for the probe; 78,000 miles an hour for Venus and 66,000 miles an hour from Earth.

But the simplest reason barring a Venus or Earth impact is the fact that when the probe intersects the planets' orbital paths, Venus and Earth will be elsewhere in their endless races around the Sun. And vice versa.

This probe's mission differs from past successful Sun-orbiting probes -- both the Soviet Union's Lunik I (January 2, 1959) and the United States' Pioneer IV (March 3, 1959) -- in that this package is to be put inside the Earth's orbit. Lunik I and Pioneer IV are in orbits between the Earth and its outboard neighbor, Mars.

To get in such an orbit, this probe will be launched in the morning. As the rocket nears Earth escape velocity (25,200 miles an hour or, precisely, seven miles per second), it will follow the curve and directional spin of the Earth. When it escapes, the probe immediately will be swept into a Sun orbit by the Sun's gravitational force and run counter-clockwise around the Sun like the rest of the planets.

Imagine viewing the launch from a stationary platform high above Earth and Venus. The sun would have just come up on Cape Canaveral. The probe would pull away from the Cape, turn and follow the Earth's curve toward the Sun as it gained velocity. On escaping the Earth's pull, the probe would be pulled obliquely away from the Earth by the Sun and into its own orbit.

Another example would be to look down on two track men running in the same outside lane of a circular banked track. Then one of the runners cuts to an inner lane -- in effect, what the probe does.

The probe should find itself in a 506-million mile track, taking 295 days. The Earth traces out a 584-million mile path in 365 days while Venus covers a 422-million mile circuit in a 225-day year.

The probe's precise orbit will be determined by its burnout launch velocity. It must be going nearly 25,200 miles an hour to get away from Earth. To get into the programmed orbit, it must be going slightly faster. Velocity in excess of that programmed would make its orbit more eliptical, less would make the orbit more circular. Slightly less than escape velocity would produce an Earth satellite in an Explorer VI - type orbit.

The farthest the probe could ever be from Earth -- on the planned trajectory -- would be some 186 million miles. The closest could be several hundred thousand miles, within the next decade.

The powerful 150-watt UHF transmitter aboard may permit Earth-probe contact for the first few months of the flight, to distances of up to 50 million miles, its STL designers believe.

To get some idea of the great distances involved, a radio signal transmitted over the 50-million mile route would take approximately four and a half minutes to make the trip. That's because radio signals travel at the speed of light -- 186,000 miles per second. At that distance, the probe itself would have traveled about 5,300 miles during the radio signal transit time. Similarly, the Earth would have covered about 4,900 miles.

In order to get as precise information as possible on the orbit, the probe's signals will have to be plotted most exactly on the early phase of the flight. These early signals will come from a payload transponder which receives a signal from Earth tracking stations and bounces it right back by rebroadcasting it.

Also in the early part of the flight, a 5-watt transmitter will be used to read out experiment data. After the probe gets more than several million miles from Earth, the 5-watt transmitter will be used to read out experiment data. After the probe gets more than several million miles from Earth, the 5-watt unit will become a "booster" amplifier for the 150-watt transmitter which from that point on will be the sole radio contact.

There are several reasons for the powerful transmitter which has an output 20 times greater than any transmitter the United States has flown in space experiments. One reason is to demonstrate the feasibility of long range space communications. Another involves a new method of measuring astronomical distances.

To date, the distances within the universe have been computed through basic laws of physics governing bodies in motion and plotting positions against seemingly stable, distant stars. To astronomers, the basic unit of measurement is the AU or Astronomical Unit -- the mean distance between Earth and Sun or approximately 93 million miles.

Most scientists agree that this measurement is accurate to only plus or minus 50,000 miles. While this tolerance may seem small when dealing with millions and billions of miles, it is important to future space missions to have more precise values. Successful long range communication with this payload will surely add to our spatial measurement knowledge. The scientists should be able to triangulate between Earth and several signal plots from the probe to give us new values.

The transmitter, associated electronics, batteries and solar cell power supply make up more than half the probe's total weight, 50 of its overall 90 pounds.

The power requirements of the 150-watt transmitter will make it possible to communicate at great distances with the payload only five minutes out of five hours. During the intervening period, solar cells will recharge the payload's nickel-cadmium batteries. Presently the distance record for deep spae communication is held by Pioneer IV. Tracking stations stayed in contact with that probe out to 407,000 miles before its batteries went dead more than 80 hours after launch. Pioneer IV did not contain solar cells.

The probe's paddlewheels -- four jutting from the sphere's equator as in the earlier flights -- will be somewhat smaller, about 18 by 14 inches, and carry fewer energy-converting silicon solar cells -- 4,800 cells as opposed to Explorer VI's 8,000 cells. This is partly because of design and weight limitations. Another factor is that the solar cells should get 30 to 40 per cent more intense solar energy because the probe will be flying closer to the sun. From tip to tip, the "paddlespan" is about four and a half feet.

During launch, the paddles ride folded down about the base of spherical payload under an eight-foot plastic nose fairing covering payload and third stage. Seconds before the second stage burns out, the fairing will be jettisoned when explosive fasteners are triggered. The fairing is the same as the one flown successfully in the Explorer VI launch.

Seconds after the fairing blows away, a line holding down the paddles is released. Springs in the paddle arms will then force the paddles upward until they lock in place, each slightly canted to receive a maximum of sunlight.

Guidance also is important to the success of any space mission. In the early part of the flight, guidance units in the first and second stages of the Thor-Able will steer the vehicle. Programmed autopilots will take care of routine flight corrections. But additional commands can be radioed to the second stage guidance package to take care of more difficult turns and course corrections.

Course changes are accomplished by gimballing the thrust chambers which changes the direction of the thrust.

The third stage contains no active guidance but maintains the course given it by the second stage. It does so by having been "spun up" by six small spin rockets about the base of the second stage. These spin rockets fire laterally and make the upper stages spin at the rate of 120 revolutions per minute. The effect is the same as the rifling grooves in a gun barrell.

Payload and third stage are separated by a timer which actuates a spring, forcing the two apart.

Precise tracking information on the flight of the first two stages as well as the payload will be furnished by lightweight transponders.

The change in the frequency or tone of the transponder signal can be calibrated with high accuracy. This tells how fast the stage or payload is going. That information is run through a computer on the ground which produces, in a matter of seconds, the proper guidance commands.

The payload is instrumented to get some basic measurements: radiation readings, magnetic fields in space, the action of gaseous "clouds" of plasma floating through space, micrometeorite activity and solar flare effects ...

The temperature control system is based on the heat absorbing and reflecting qualities of light and dark surfaces. This accounts for the special paint pattern on the skin of the payload. The internal payload temperature should stay between 30 degrees F. and 80 degrees F. The external temperature will vary several hundred degrees above and below 0 degrees F.

Unlike the earlier paddlewheel payloads, this package does not carry a TV-like scanning device. The reasons are, again, weight limitation plus the fact that the probe will never be close enough to any major body in space to photograph it.

Within the sphere, the experiments and electronics are bolted to a re-inforced plastic flooring across the waist. The experiments include:

High-Energy Radiation Counter

This is a five-pound radiation device, developed by the University of Chicago, which is to measure high-energy or "hard" radiation, particularly those hurled into space by the Sun. Since no probe has flown so close to the Sun, the scientists don't know precisely what to expect -- which is the primary motivation behind all scientific space experiments.

The package consists of six argon gas-filled cylinders ranged around a seventh cylinder. The total bundle, including a thin lead shielding, measures about two inches square. Inbound particles will ionize the gas in the tiny cylinders to create an electrical blip as they penetrate one or more cylinders -- depending on their potency. A similar instrument in Explorer VI tentatively located a band of hitherto undetected high-energy radiation near the inner edge of the earth's Great Radiation Belt.

Total Radiation Flux

An ionization chamber and a Geiger-Mueller tube will be used to measure the total radiation flux encountered. They are particularly sensitive to medium energy radiation. These instruments were supplied by the University of Minnesota.

The gas-filled ion chamber is to provide particle energy information and the Geiger Mueller tube is to count the number of medium energy electrons and protons passing through. Together the instruments weigh about two pounds and ride in a four-inch square box.

Micrometeorite Counter

The micrometeorite device, developed by the Air Force Cambridge Research Center, is to measure the number and momentum (mass times velocity) of meteoric dust particles striking the probe. The entire unit weighs less than a pound. It consists of a diaphragm about twice the size of a playing card, mounted on the payload skin and a microphone inside the package. The noise of the impact is translated into an electrical impulse which is relayed to earth.

Magnetometer

A one-pound search coil magnetometer, developed by STL, is the lone magnetometer in the payload. It also was developed by STL. It is designed to determine the strength and direction of magnetic fields in space. Magnetic field information ties in closely with radiation studies.

Aspect Indicator

An eight-ounce photoelectric cell called an aspect indicator, developed by STL, is to trigger a specific electrical impulse when it "looks" directly at the sun. These "fixes" on the sun should make more meaningful information from the magnetometers and radiation counters.

Other Instruments

In addition to the prime scientific experiments listed, the payload contains a number of amplifiers, "logic" units which transform various instrument sensing actions into transmittable signals and a command compartment capable of initiating some 10 payload functions. Five tiny thermistors will record temperatures, two outside on the paddles and three within the payload.

The overall payload weight breaks down into two major headings: structure shell and experiments -- 40 pounds; transmitter, electronics and power supply -- 50 pounds.

Commands will be transmitted to the payload in a complex multi-digit code. A command radio receiver -- on at all times -- will route the inbound signal to a command box which will unscramble the signal and close circuits to execute the desired command.

The probe carries one five-watt ultra-high frequency (UHF) transmitter which, on command, becomes an amplifier for the 150-watt transmitter. Both are hooked to all instrumentation but only one transmits at a time. The transmitters will send on 378 MC.

When a transmitter is not operating, all of the experiments aboard will continue to function and their findings will be stored in small electronic accumulators or memory units. These work much like the total mileage register of a speedometer in that they record a given experiment's total action. When payload radio transmitter is turned on, the totals are transmitted first, then the transmitters start sending experiment functions as they occur.

Tracking

A number of United States tracking outposts around the world will take part in tracking this satellite but principal command and data reception points are:

Jodrell Bank, a 250-foot parabolic tracking dish plus helical antennae at Manchester, England, operated by the University of Manchester. This station has both payload command and telemetry reception capability.

Millstone Hill, N. H., an 85-foot parabolic dish, built and operated by the Lincoln Laboratories of the Massachusetts Institute of Technology. This station will be used for telemetry reception and initial launch radar "skin-tracking."

South Point, Hawaii, a 60-foot parabolic dish and helical antenna, operated by STL. This station will be used for commands and telemetry reception.

Singapore, Malaya, small antenna arrays, operated by STL. It will be used for telemetry reception.

Atlantic Missile Range, Cape Canaveral, Fla. a variety of antennae which will be used to send steering commands to the second stage during launch. This station, operated by STL, also will be used for early data reception.

All of these stations will be linked on a teletype circuit, the control point of which is STL's Space Navigation Center in Los Angeles.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

HOLD FOR RELEASE
UNTIL LAUNCHED

No. 2
March 8, 1960

BOOSTER

Consisting of three stages, the Thor-Able IV rocket stands 90 feet high and weighs more than 105,000 pounds.

Earlier versions of the vehicle were used in three space probes in 1958. The first of them blew up after 77 seconds because of malfunction in the Thor first stage (August 17, 1958). The second, labeled Pioneer I, rose to 70,700 miles and returned valuable data (October 11, 1958). The third, Pioneer II, fell back after reaching 970 miles altitude when the third stage failed to ignite (November 8, 1958).

The first two stages of Thor-Able also have been used in a number of 5500-mile nose cone re-entry test flights.

Here is a breakdown of the stages and their functions:

First Stage:

Improved Thor, intermediate range ballistic missile, minus IRBM guidance and modified to receive additional stages.

Weight -- Over 100,000 lbs.

Thrust -- Approximately 165,000 lbs.

The liquid-fueled Thor propels the vehicle for more than 160 seconds after launch. During this period of time, the rocket is controlled by roll and pitch programmers. Upon separation, the Thor re-enters the atmosphere and disintegrates.

Second Stage:

Powered by a liquid-fueled engine, the second stage was adapted and modified from earlier Vanguard and Thor-Able rocket vehicles. Six small spin rockets are ringed around the outer skin of the stage. The second stage fires immediately after first stage separation.

Weight -- Over 4,000 lbs.

Thrust -- Approximately 7,500 lbs.

Stage two propels the vehicle for about 100 seconds. At second-stage burnout, a plastic nose fairing covering the third stage satellite is jettisoned and falls away. Also at second stage burnout, the spin rockets ignite causing the second and third stages and the payload to rotate at the rate of 120 revolutions per minute. The spin stabilizes the trajectory of the third stage and payload. About a second and a half after the spin rockets fire, second-stage separation occurs. The second stage then falls and burns up on entering the earth's atmosphere.

Third Stage:

A solid-propellant rocket, the third stage was adapted from the Vanguard and Able I rocket vehicles. It propels the payload to earth escape velocity, about 25,000 miles and hour before separating.

Weight -- Over 500 lbs.

Thrust -- Approximately 3,000 lbs.

The third stage, which burns for about 40 seconds will coast into a sun orbit behind the payload. Separation occurs about 20 minutes after third-stage burnout when a set of springs forces the third stage and payload apart. Burned out, the empty third-stage casing weighs about 50 pounds.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

HOLD FOR RELEASE
UNTIL LAUNCHED

No. 3
March 8, 1960

CONTRACTORS

This probe is being conducted by NASA, with technical assistance by AFBMD. Under contract to AFBMD, STL provided overall system integration and payload packaging. More than 50 scientific and industrial organizations and universities participated in the development of this program.

Principal participants are:

Atlantic Research Corporation, Alexandria, Va.;

Engineered Magnetics, Hawthorne, Calif.;

Gilfillan Bros., Los Angeles, Calif.;

Hallamore Electronics Co., Anaheim, Calif.;

Hoffman Electronics Inc., Evanston, Ill.;

Motorola, Inc., Phoenix, Ariz.;

Radiation, Inc., Melbourne, Fla.;

Rantec, Inc., Calabasa, Calif.;

Air Force Cambridge Research Center;

Space Electronics Corp., Glendale, Calif.;

The University of Chicago, at Chicago, and the University of Minnesota at Minneapolis.

Here is a breakdown of major contractor responsibility:

First Stage (Air Force Thor IRBM)

1. Propulsion systems -- Rocketdyne, Division of North American Aviation.
2. Airframe, control, electrical, and instrumentation systems -- Douglas Aircraft Company.
3. Assembly, integration, checkout, and launch -- Douglas Aircraft.

Second Stage

1. Propulsion system and tanks -- Aerojet-General Corporation, a division of General Tire and Rubber Co.
2. Control, electrical, instrumentation, engine shutoff, and spin rocket systems -- STL.
3. Assembly, integration, and checkout -- STL.

Third Stage

1. Rocket motor -- Allegany Ballistics Laboratory of Hercules Powder Co.
2. Structure and electrical -- STL.
3. Assembly, integration, and checkout -- STL. Payload -- STL.

Launch Operations

1. Pad, test, checkout -- Douglas Aircraft
2. Launch crew -- Aerojet-General
Douglas Aircraft
Rocketdyne
STL

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

HOLD FOR RELEASE
UNTIL LAUNCHED

No. 4
March 8, 1960

PROJECT OFFICIALS

Principal NASA officials involved in this program are Dr. Abe Silverstein, director of Space Flight Development, and Dr. John Lindsay, head of the solar physics program of the Space Sciences Division.

Key AFBMD-STL personnel in the program are Major General O. J. Ritland, commander of the Air Force Ballistic Missile Division; Dr. Ruben F. Mettler, STL executive vice president and senior project advisor; Colonel Richard D. Curtin, AFBMD deputy commander for Military Space Systems; Dr. George E. Mueller, STL vice president, associate director of the Research and Development Division, and senior project advisor; Lt. Colonel Donald R. Latham, AFBMD director of Space Probe Projects; Dr. Adolph K. Thiel, STL director of advanced Experimental Space Missions and project director; and Major John E. Richards, AFBMD chief of the Astro-Vehicles Division within the Space Probes Directorate.

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

RELEASE NO. 60-137

FOR RELEASE: Thursday AM's
March 10, 1960

LANDIS S. GEPHART NAMED DIRECTOR, OFFICE OF RELIABILITY AND SYSTEMS ANALYSIS

Landis S. Gephart has been appointed Director of the newly created Reliability and Systems Analysis Office, Richard E. Horner, NASA's Associate Administrator, announced today. Until his appointment, Dr. Gephart was Chief of the Exploratory Research and Reliability Branch, Technical Operations Division, Advanced Research Projects Agency.

Dr. Gephart will be responsible for directing a NASA-wide program of prediction, evaluation, and improvement of the operational reliability of all major NASA space systems including launching vehicles, satellites, and space probes. In addition, his office will manage NASA reliability study contracts with industry. The director of the office will report to the Associate Administrator.

Born in Dayton, Ohio, in 1917, Dr. Gephart earned a B.S. degree from the University of Dayton in 1940; an M.S. degree from Miami University in 1948; an M.A. degree from the University of Dayton in 1949; and a Ph.D. in mathematics from the University of Florida in 1955.

Dr. Gephart's previous posts include: Mathematician with the U.S. Air Force Cambridge Field Station and at Wright Air Development Center; Chief of the Design of Experiment Office and Statistics Branch in the U.S. Army's Office of Ordnance Research; Scientific Advisor to the Chief of the European Research Office of the Army's Research and Development Liaison Group in Europe.

NASA's new reliability director has been a Visiting Professor of Mathematics and Statistics at Duke University, an Assistant Professor of Mathematics at the University of Dayton, and a lecturer in Mathematics at George Washington University. He is currently a member of the Institute of Mathematical Statistics, the American Statistical Association, and Sigma Xi.

Dr. and Mrs. Gephart, the former Elvera Vocke, and their five daughters have been making their home at 736 Bowen Street, Dayton, Ohio.

- END -

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

FOR RELEASE UPON PRESENTATION
(Expected at 10:00 a.m.
March 14, 1960)

Statement by

Dr. T. Keith Glennan, Administrator

National Aeronautics and Space Administration

before the

Independent Offices Subcommittee

of the

House Committee on Appropriations

March 14, 1960

* * *

Mr. Chairman and members of the Committee:

It is my privilege to present the National Aeronautics and Space Administration's $915,000,000 budget appropriations request for Fiscal Year 1961. This sum will support an aggressive, broadly based space exploration program essential to our national security.

NASA takes seriously its responsibility for a program of this magnitude in the complex and costly business of space research and development. If the Congress approves the funds requested, the United States will be able to move solidly toward its long-range goal of manned flight to the moon and planets. In the shorter range, we confidently expect to reassert the leadership of this Nation in the many branches of technology involved in making possible the prosecution of a program of scientific research that must certainly lead to applications that will benefit mankind the world over.

The $915,000,000 request is broken down as follows:

...$621,453,000 for Research and Development.

...$122,787,000 for Construction and Equipment.

...$170,760,000 for Salaries and Expenses.

I think it would also be useful to break the request down by program as follows:

...$129,379,000 for the Office of Advanced Research Programs which is charged with advanced research in aeronautics and astronautics.

...$370,132,000 for the Office of Space Flight Programs which directs mission planning, payload design, and in-flight research and operation.

...$402,023,500 for the Office of Launch Vehicle Programs which will develop and launch rocket vehicles.

...$12,465,500 for Program Direction, which includes headquarters operation.

Before we get into a detailed explanation of our programs and funding requests, I would like to set forth my evaluation of the position and responsibility of this Nation in the field of space exploration, the broad outlines of our long-range plan, and the underlying philosophy which influences NASA in the conduct of its many activities.

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I believe that the space exploration program with manned exploration of the moon and the planets, is the greatest challenge ever to face mankind.

Space has been the one environment so far inaccessible to man. With his successful conquest of the atmosphere, man's drive to fly higher and faster has led him to the edge of space. With increased understanding of, and control over, the mechanisms and materials of propulsion, it was only a matter of time before he would begin to explore the solar system.

It now seems as though all elements necessary to support of such an effort are available to us, provided the people of this country want the job done. And I believe they do.

The Space Age is upon us and the U.S. cannot afford to lag in space research and exploration even though the cost will be high.

If we accept this situation, we must then consider the desirable rate and scale of our space effort. Here, unfortunately, the choice is not completely in our hands. The Soviet Union is making impressive progress in this field.

As you well know, the USSR is using its space activities for propaganda purposes to persuade the peoples of the so-called "uncommitted" nations, whose industrial development has been long delayed, that the Communist way of life is superior in all respects. Only as a secondary consideration does the search for new knowledge that will one day be useful to mankind, seem to motivate the people in control of the Soviet effort.

We cannot ignore the impact made the world over by Soviet successes in this field. Theirs have been spectacular and apparently successful experiments made possible largely because they possess rockets of higher thrust than those presently available in our program.

I am convinced that this Nation must meet the challenge of Communism in whatever contest we find ourselves engaged. Space exploration is only one of the areas of competition. But it is _the_ one with universal public appeal. It is _the_ one in which they appear to the general public, to have a substantial edge.

I admit their superiority _only_ in the area of propulsion. And I do not think they will maintain that superiority for long if we continue to build up our capability to undertake experiments that will lead to beneficial results and be convincing in the international arena as well.

It is important, therefore, that we lay out our own program -- regardless of the direction the USSR appears to be taking at any given moment -- fund it adequately, and press forward with vigor and determination.

In my opinion, we are not going to achieve this superiority by excessive expenditures, by concentrating solely upon "spectaculars," or by responding to the anguished cries of those who seem intent on making us believe, and are encouraging the rest of the world to believe, that we are so far behind that we may never forge ahead. In the first place, except in the impression created by an admittedly able effort involving the use of high thrust, rocket-propelled launch vehicle systems, I don't admit to our being behind. Further, our plans and efforts to overcome our disability in the high thrust rocket field are moving solidly ahead. This effort needs support -- and the balance of the program needs adequate support if we are going to be able to utilize the higher thrust effectively when it becomes available to us.

Mr. Chairman, this is not a time for crash programs that lash out in many directions regardless of cost. This is a tough problem requiring sensible planning, adequate support, and continuous efforts to move toward solid goals. That is exactly what I propose to set forth in broad outline for you now -- our first attempt at a plan looking 10 years into the future.

As you well know, research and development activities do not lend themselves to overly definitive planning so far ahead. They are fluid by their very nature and subject to continuing review. And, of course, what we accomplish next year -- and three to four years from now -- depends in large measure upon what we achieve this year.

Subject to these qualifications, however, I think the need for such a long-range program is obvious. Most of our programs presume a scheduled progress in launch vehicle and spacecraft development. We are dealing with lead times of five to six years -- and longer. We must have objectives upon which to focus.

The first chart outlines the anticipated growth in spacecraft weight from year to year. Spacecraft, incidentally, is a new term that we apply to that part of the vehicle which is to be placed into an earth orbit or on a departure trajectory from the earth. The term includes the propulsion, attitude controls, and guidance units for maneuvering the spacecraft as well as the instrumentation for the experiments to be undertaken.

For comparative purposes, the chart measures spacecraft weight that can be projected into a low altitude earth orbit of about 300 miles.

In the early years our increasing capabilities will come about through use of the Thor-Agena B, Atlas-Agena B, and Atlas-Centaur.

In the 1963-67 time period, the Saturn first stage and successively improved upper stages of liquid hydrogen-liquid oxygen will account for our increased capability.

I would now like to consider our projected launch schedule which is illustrated in the next chart.

You will note that by fiscal year 1962 and beyond, the present variety of first stage launch vehicle types will be reduced to one solid propellant rocket, the Scout, and three liquid propellant rockets -- the Thor, Atlas, and Saturn.

The Agena B and Centaur will become our utility second stages for Saturn until larger, high-energy upper stages come into use on Saturn in the fiscal year 1965 and beyond.

Through restriction of vehicle types, ~~and more~~ intensive experience with each, we expect to achieve long-needed reliability.

Beyond Saturn, the use of chemical fuels would lead us as I have said earlier, to a vehicle concept known as Nova, with four to six times the Saturn thrust based upon use of the F-1~~, 1,500,000-pound~~ single ~~chamber~~ engine. Development testing on Nova would occur in the 1968 time period.

The next chart deals with NASA's mission target dates. You will note that in the current year we are initiating tests of several vehicle development programs as well as the first orbital experiments in meteorology and communications. Also included are the first sub-orbital flights of the astronauts later this year.

In calendar year 1961 we will be working toward the launching of an advanced lunar impact vehicle and initiation of Centaur flight tests. If all goes as planned in Project Mercury, the first manned orbital flight will take place in calendar 1961.

From this point on, the major milestones in the 10 Year Plan include a comprehensive exploration program of the moon and the near planets, and development of the Saturn vehicle to provide preliminary data leading toward manned circumlunar flight beyond 1970.

Such are the major objectives of NASA as we now see them. We are concentrating upon lunar experiments for many reasons. The moon is a scientific object of great interest; it may hold many keys to the origin of the earth. Furthermore, the lunar distance will provide us with the experience to attempt interplanetary flights later on. In short, we will be able to perfect our communications, guidance, and propulsion systems with a lunar target.

The program for which we are requesting $915,000,000 in fiscal 1961 will assure steady progress toward the goals just delineated. It is a program calculated to yield significant results in the fields of science and technology, results which must certainly strengthen the Nation's position of international leadership. It is a program which we will carry out with due regard for an operating philosophy which combines the following elements:

(1) A recognition of the vital role to be played by the success or failure of this program in maintaining the posture of this Nation as a leader of the Free World. Leadership in space research and exploration has come to mean leadership in most areas of science and technology when viewed by the industrially underdeveloped nations.

(2) A recognition of the necessity for taking calculated risks in the dynamic development of this difficult new technology. Such a policy must not be pursued blindly just to meet dates set for political or other reasons. But the pace should be an extremely urgent one.

(3) A determination to use the authority established in the Space Act to encourage cooperative programs in space research with able scientists of other nations. The space exploration program is proving to be a natural vehicle for worldwide cooperation in such matters as tracking, communications and meteorology.

(4) A determination to cooperate with, and provide support to, the Department of Defense. Each must surely benefit from the

experience and findings of the other. Unnecessary duplication must be avoided.

(5) A recognition of the importance of using competitive private industry to carry the major portion of NASA activities. Avoidance of additions to the government's payroll will result in the strengthening and broadening of our industrial base for research, development and operations in space exploration.

(6) A recognition that, while adhering to the concept of open discussion of the unclassified portion of our activities, it is important that we first accomplish our objectives and only then talk about them. Difficult as this may be, we will strive to achieve a continually increasing degree of acceptance of this philosophy. Unlike a dictatorship, however, we will continue to announce our failures as well as our successes.

I want to express my appreciation to the Committee for its alert, continuing interest in our program.

With me today are several of my associates who will also discuss the fiscal 1961 request. They are prepared, as I am, to answer any questions you may have.

-END-

No. 60-143

Friday, 18 March 1960.

PRESS CONFERENCE

PIONEER V PROGRESS REPORT

The press conference was called to order at 1:54 a.m. by Mr. Herb Rosen, NASA, moderator.

PANEL MEMBERS:

DR. KEITH GLENNAN, Administrator, National Aeronautics and Space Administration.

THE HONORABLE OVERTON BROOKS, Member of Congress, Chairman, House Committee on Science and Astronautics.

DR. JOHN LINDSAY, Project Officer for the Pioneer V Project.

ED CORTRIGHT, Assistant Director of Lunar and Planetary Programs, Office of Space Flight Programs, NASA.

+ + +

DR. GLENNAN: Ladies and gentlemen: I will concede that 2:00 a.m. is an unusual hour for a press conference, but we think the significance of this occasion warrants special observance.

Briefly, in a few minutes the United States interplanetary probe Pioneer V, launched last Friday morning from Cape Canaveral, Florida, will be 1,000,000 miles from Earth. We will command a radio transmission from South Point, Hawaii, which is to turn on Pioneer V's 5-watt transmitter to mark another milestone in space to earth communication. If all goes well, we will hear the probe's reply here in Washington.

But first let me tell you of Pioneer V's progress. The probe will fly closer to the sun than any man-made object has ever flown -- within 74.9 million miles of the sun -- and within 8,000,000 miles from the orbit of Venus. It is exploring the 26,000,000 mile gap between the orbits of Earth and Venus.

Tracking stations in the United States, England and Malaya have received approximately 14 hours of telemetered data. The probe's transmitter is being commanded on 4 to 5 times a day for 15- to 30-minute transmissions. The signal strength has been good. Instrumentation aboard the 94.8 pound probe appears to be working well.

Data received to date indicate the internal probe temperature is running about 75 degrees Fahrenheit. External temperatures on the solar cell paddles are about 27 degrees Fahrenheit. These readings are well within the design criteria.

To sum up, we here in NASA are very pleased with Pioneer V, and I also want to cite and commend our colleagues in this program: The Air Force Ballistic Missile Division, which furnished technical assistance; the Space Technology Laboratories, Inc., which provided design and systems engineering; the University of Chicago and the University of Minnesota, and a lot of other groups in science, in industry, and in Government. To all of you: well done!

And now, hello, Hawaii. Proceed to interrogate Pioneer V at 0700 Greenwich Mean Time.

VOICE: This is Span Center calling Hawaii. You will proceed to operate Pioneer V at 0700 GMT. You will operate the 5-watt transmitter at one pulse per second. Your command will be 0-7. Your azimuth will be 239.035 degrees. Elevation 19.105 degrees.

Range, from your station, will be 1,002,740 statute miles.

You will turn on your ground transmitter at 0659 GMT. It is now 0658.

It is now 20 seconds to turn on.

Turn on the Bell transmitter. On my mark turn on ground transmitter.

Mark.

Ground transmitter is now on.

Are you receiving the signal in L.A.?

VOICE: Yes, we are.

DR. GLENNAN: We are receiving it in Washington loud and clear.

VOICE: What is your signal strength?

VOICE: Minus 147 dbm. It came up a little about minus 146.

VOICE: Continue sending signals to L.A.

DR. GLENNAN: I would like to introduce to you Dr. John Lindsay, who has been our chief scientist, the NASA chief scientist on this project.

John?

DR. LINDSAY: Thank you.

You notice that when the received signal was first placed on the line that there was a background noise. This might be called cosmic noise. The reason for that is that in transmitting the signal there is a delay due to the time it takes for the transmitting signal to reach the Pioneer V payload and for it to respond, and the signal to be transmitted back to the Earth.

I understand it takes about 5.4 seconds each way. Each transmission is about 25 minutes long. So the one that was initiated just a few minutes ago will continue for about 25 minutes.

Hawaii will be reducing the data that has just been received, and very shortly it will be transmitted to Washington and will be presented to you in just a few minutes.

The data will consist of the cosmic ray counts from the University of Chicago and the University of Minnesota experiments, Goddard Space Flight Center micrometeorite experiment, Space Technological Laboratories magnetometer experiment, and some internal temperatures. I don't know whether they will be able to supply reduced data on all of these experiments in the next few minutes or not. We anticipate that they will be able to reduce some of it in the next few minutes.

I would like to say a word about some of the scientific possibilities of this payload.

We are exploring the part of space that has been unavailable to us before. It is possible, with the experiments aboard, to determine the time of flight of cosmic ray particles from the sun to the Earth, the idea being that since this payload is closer to the sun than the Earth, the payload will encounter them at a certain time and we can measure the delay.

Of course the other point that I mentioned was that this is an experiment that may establish where cosmic rays come from. If they are from the sun we should be able to determine that.

In this interplanetary space it is anticipated that the payload will encounter some plasma clouds, drifting clouds of charged particles. If this is the case we should be able to detect it, measure the particle flux in these plasma clouds, and also have measurement of the magnetic fields.

One of the other points is that during the solar cycle -- as you know there is an 11 year solar cycle, the solar activity being more intense at some times than others -- it has been observed on the Earth that the cosmic ray background decreases from solar maximum. We have just been passing through a solar maximum. By getting outside the influence of the Earth it will be possible to determine whether this cosmic ray decrease is due to some effect associated with proximity to the Earth or whether it is actually a decrease in the particles emitted by the sun.

One other point. It has not been established whether the high energy particles measured in the radiation field arrive from the sun with high energies or whether they are accelerated by some process in the Earth's magnetic field.

Pioneer V should be able to answer the question whether high energy particles are emitted by the sun.

I believe that that is all that I have to say.

QUESTION: Dr. Lindsay, I believe you mentioned that the decoding would be done in Hawaii, at South Point Station. I was wondering if I just heard wrong. I thought I heard something from Los Angeles, that they were going to have the signal transmitted there and do the decoding?

DR. LINDSAY: Standard procedure is that the raw data would be transmitted to Los Angeles, and they reduce the data. For this particular occasion I think that they are using the instrument in the field to read the data off as they come in, and transmit directly to us. If they do otherwise we would be here for quite awhile.

QUESTION: "In the field" being at South Point this time?

DR. LINDSAY: Right. This was the information that I have.

QUESTION: How many channels of data are coming through?

DR. LINDSAY: I don't quite know what you mean by channels.

QUESTION: Will they be modulating the 163 megacycle signal?

DR. LINDSAY: 378, yes. It is supposed to be that, approximately. This is an additional system.

MR. ROSEN: We have the data from the last transmission.

wbl

DR. GLENNAN: I am going to ask Congressman Overton Brooks, whom you all know as Chairman of the House Committee on Science and Astronautics, to read back the first information received from somewhat over a million miles in space.

MR. BROOKS: Dr. Glennan and friends. Here are the data just received and given to me from a million miles out in space, transmitted through Hawaii and Los Angeles to here. It is technical and I will read it very slowly.

Computed results from data just received:

Cosmic ray experiments: There are two counts from the University of Chicago. One count is 374; the other count is 569.

There are two counts likewise from the University of Minnesota. Count 1 is 49, steady; the other is 149, steady.

Here are the results from the micrometeorite experiment: light impacts, 87; heavy impacts, 5.

The temperature in the payload is 63 degrees Fahrenheit; the solar cells temperature is 27 degrees Fahrenheit.

The magnetometer is functioning satisfactorily.

Those are the first data just received from this vehicle a million miles out in space.

I want to say here -- because I am Chairman of the House Committee on Science and Astronautics -- that this is an historic occasion. The results achieved here at this hour are really fantastic. It is almost unbelieveable, for this is the first time in all history that sound has been transmitted a million miles and then a reply has been received. And not only sound transmitted, but intelligible sound transmitted in the way of messages.

This means, to my mind, there is no such thing any more as distance, and there is no such thing as space when you can transmit messages at that great distance.

This means to me, as a Member of Congress, as Chairman of the House Committee on Science and Astronautics, substantial progress is being made in our space program, and I am sure that the Members of Congress, generally, will feel wb2 that this is substantial progress that we are making in our efforts in the Space Program.

I wish to say for Dr. Glennan and NASA: Many more successes in the future of this character and this magnitude. I want to congratulate Dr. Glennan and NASA, and Dr. Lindsay, who has parented this particular project, for the magnificent results obtained, and I know the American people are going to be literally thrilled by the results given them by the press, radio and television in the morning.

MR. ROSEN: Gentlemen, if you wish we will throw the floor open to questions and answers.

Let me repeat them so everybody can hear them.

QUESTION: Would you ask somebody to give us a quick meaning of these counts on the cosmic rays?

MR. ROSEN: May we have what the counts mean?

DR. LINDSAY: The storage system in the payload is an accumulator, very much like your automobile mileage indicator, your odometer. This is the total number of particles detected.

Let me clarify that. It is not necessarily the total. It is the total that is in the accumulator at this time. The accumulator resets after the number 1024 setting. That is the largest number that you can store. So after reading 1024, it resets. So this is the total number that is in the accumulator.

For this to mean anything scientifically you should take the difference between this and the last number that has been measured, because that represents the number of particles that have been detected.

It is a measure of the particle flux.

QUESTION: Is it remarkable, different, startling, or what?

DR. LINDSAY: I have talked to the University of Minnesota and the University of Chicago this evening, and they are very well pleased with their equipment. It is functioning perfectly.

wb3

As far as there being any startling scientific discovery at this time, no one is in a position to say, because reducing the data is a long drawn out affair.

They have correlated quick-look data with that which was obtained on Explorer VI. They correlate very nicely. In fact, within two percent of each other for the two experiments.

QUESTION: Do you think these are cosmic ray counts? Or what are they?

DR. LINDSAY: I am not in a position to answer that right now. They may be. They may be due to the kind of measurement I mentioned a while ago. You may be going through a plasma field with particles. I don't think we are going to know until we have really made a carefully analysis of the results.

QUESTION: Is this micrometeorite count unusual, heavy, or low?

DR. LINDSAY: It is about what one should expect.

In other words, it is no different at that distance than in close.

QUESTION: Are all four of the paddles, or vanes, in position? Is that knowledge known?

MR. ROSEN: The question is, Do we know that all the paddlewheels are in position?

DR. LINDSAY: Let me make a statement. In the checks that I have made, there is no deficiency in this payload that is known. There is some question about the magnetometer experiment, but it is suspected that the spin axis of the payload is pointing toward the sun, so the photo tube that detects phase is not able to see the sun. At a later time as it proceeds around its orbit they think that it will be able to see the sun and function properly. Of course one of the first questions I asked after launch was How is the charging rate on the batteries, because we did have some difficulties you know with Explorer VI.

It appears that if anything it is a little better than normal.

wb4 QUESTION: I remember when it was launched it was said at one point that two of them were definitely in position.

DR. LINDSAY: This is correct. The reason that this statement was made was the one of the paddles, when it locks up, turns on the 5-watt transmitter during launch. The transmitter came on.

One of the other paddles arms separation. Separation of the third stage payload was by radio command. Separation would not have occurred if the paddle did not lock up. So we are sure, even at the early moments after the launch, that these two paddles had locked up.

The only way of ascertaining how the others were working was to examine the charging rate on the batteries. This has been done and it was reported to me that the charging rate is above normal, slightly, which means that the solar power supply is working very well.

MR. ROSEN: Are there any more questions?

Thank you very much, Gentlemen.

(Whereupon, at 2:25 a.m., the Press Conference was concluded.)

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: 12 noon, March 19, 1960
RELEASE NO. 60-144 - Released Jointly by the Department of State and the National Aeronautics and Space Administration

UNITED STATES AND SPAIN TO ESTABLISH PROJECT MERCURY TRACKING STATION

The United States and Spain announced today that the two nations have signed an agreement to cooperate in the establishment of a Project Mercury tracking station in the Canary Islands. The station will be one of the sixteen located throughout the world which will comprise the Mercury tracking network.

The Canary Island facility will be used solely for non-military scientific purposes. The Mercury program is a large step forward in the scientific effort directed toward future interplanetary travel and exploration of the solar system. The project is designed to put a manned satellite into a controlled orbit around the earth, return both man and vehicle safely, and investigate the capability of men to withstand the space environment. The over-all program is under the direction of the National Aeronautics and Space Administration, the U. S. agency responsible for the peaceful application of space research.

At the Canary Island facility the activity will be carried out in collaboration with the Instituto de Tecnica Aeronautica, the technical agency of the Spanish Air Ministry.

The Mercury capsule will be launched into orbit from the southeastern coast of the U. S. by a powerful rocket. Current plans call for flights consisting of up to 3 complete orbits around the earth at altitudes between 100 and 150 miles. The space capsule and its astronaut will land in the Atlantic Ocean where ships will be waiting to recover it.

An indispensable part of the capsule recovery operation is the Mercury tracking network. Ground stations located around the world will keep an accurate record of the capsule's orbital flight path using radar. These stations will also receive telemetered scientific data on capsule performance and astronaut reactions. In addition, ground equipment will include communication links with the astronaut and facilities to command the capsule to re-enter the atmosphere and land.

Results of this research project will be made available to the world-wide scientific community.

Tests are now underway to guarantee the reliability and safety of the rocket-satellite system before manned orbital flights are attempted. The seven young men who have been chosen to make the historic flights into space are now undergoing intensive training to prepare them for the scientific adventure.

The Canary Island station, like the others, will have the important responsibility of tracking the Mercury capsule in its area, gathering data telemetered from the capsule on the astronaut's physiological condition, performance of the life sustaining system within the capsule, and measurements on the capsule itself. The facility will be in direct contact with the astronaut by means of radio voice communication.

The station will cost approximately $1,500,000, and construction is beginning this month.

- END -

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: Friday AM's
March 18, 1960

RELEASE NO. 60-145

PIONEER V PROGRESS REPORT

Launch: 11 March 1960 080007 EST

Altitude 78.1 degrees
Azimuth 92.9 degrees

Burn Out: Velocity 24,886 miles per hour or 36,499 feet per second.

Orbital Elements: Period 312 days
Time to perihelion 152 days
Eccentricity .104
Semi major axis 0.899 A.U. or
83.6 million miles
Inclination of ecliptic 3.35 degrees
Longitude of acending node -10.3 degrees
Argument of perihelion -2.6 degrees

Geocentric Phenomena:	Superia conjunction	5 December 1962
	Inferior conjunction	19 January 1966
Helicentric Phenomena:	Perihelion	10 August 1960
	Aphelion	13 January 1961

Distances:

At perihelion, from Sun 74.9 million miles
from Earth 46 million miles
from Venus orbit 8 million miles
from Venus 140 millions miles

At aphelion, from Sun 92.3 million miles
from Earth 84 million miles

Speeds:

At perihelion,	78,000 miles per hour
At aphelion ,	63,300 miles per hour

Earth mean speed	66,593 miles per hour
Pioneer V mean speed	68,750 miles per hour
Venus mean speed	78,403 miles per hour

At 1,000,000 miles for earth:

Time about 2 a.m., 18 March 1960
Velocity approximately 5,680 miles per hour
Time for signal to reach probe 5.4 seconds

Experiments:

Radiation

1. University of Chicago. Proportional counter telescope. Counts particles having minimum energies of 70 Mev for protons or 12 Mev for electrons.

2. University of Minnesota. Ion chamber and Geizer-Muller Tube. Results from these two instruments will provide information on incident particle flux and mean conization per particle.

Magnetic Field:

STL. Combination search-coil magnetometer and aspect aspect indicator. By using the output of a sun scanner (aspect indicator) to indicate vehicle rotational position at the time of maximum search-coil output, the direction as well as the magnitude of the components of the magnetic field normal to the vehicle spin axis can be determined.

Micrometorite Measurements:

AFCRC/GSFC. Micrometeorite momentum spectrometer. The instrument determines the times of impact of micro meteorites and separates the momenta into two groups by establishing two threshold levels.

Transmitters:

For the first few weeks, a five watt transmitter operating on 378 magacycles will be used. Then the five watt transmitter will become amplifier for a 150 watt transmitter which will be the sole radio contact.

File

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: Friday AM's
March 18, 1960

RELEASE NO. 60-146

PIONEER V REPORT : STATEMENT BY T. KEITH GLENNAN

Ladies and Gentlemen, I will concede that 2 a.m. is an unusual hour for a press conference. But we think the signifigance of this occasion warrants special observance. Briefly, in a few minutes, the United States' interplanetary probe Pioneer V, launched last Friday morning from Cape Canaveral, Florida, will be one million miles from Earth. We will command a radio transmission from South Point, Hawaii, which is to turn on Pioneer V's 5-watt transmitter to mark another milestone in space-to-Earth communication. If all goes well, we will hear the probe's reply here.

But first, let me tell you of Pioneer V's achievements. The probe will fly closer to the Sun than any man-made object has ever flown -- within 74.9 million miles of the Sun and within 8 million miles from the orbit of Venus. It is exploring the 26-million mile gap between the orbits of Earth and Venus.

Tracking stations in the United States, England and Malaya have received approximately 14 hours of telemetered data. The probe's transmitter is being commanded on four to five times a day for 15 to 30-minute transmissions. The signal strength has been good. Instrumentation aboard the 94.8-pound probe appears to be working well.

Quick-look data indicates the internal probe temperature is running about 75 degrees F. External temperatures on the solar cell paddles are about 27 degrees F. These readings are well within the design criteria.

To sum up, we in NASA are very pleased with Pioneer V. I also want to cite and commend our colleagues in this program: the Air Force Ballistic Missile Division which furnished technical assistance; Space Technology Laboratories, Inc., which provided design and system engineering; the University of Chicago and the University of Minnesota and a host of other groups in science, industry and government. To all of you: Well done!

Now, Hawaii, command the Pioneer V transmitter when ready.....

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: Wednesday
March 23, 1960
NOT FOR RELEASE UNTIL
LAUNCH

Release No. 60-148

SITUATION

This radiation belt satellite is designed to make the broadest study yet attempted of the energies present in the Van Allen radiation belts. It carries five radiation detectors and its orbit will expose them to the entire width of the Van Allen belts and beyond.

The project is under direction of the National Aeronautics and Space Administration. The Army Ballistic Missile Agency of the Army Ordnance Missile Command designed the satellite and developed and built the Juno II launch vehicle. The NASA Jet Propulsion Laboratory is responsible for the three upper stages. The radiation experiments were devised and built by the Physics Department of the State University of Iowa.

A launch inclination of 28° from the equator will give the satellite a highly ellipitcal orbit. It is desired to attain an orbit of just over 200 miles perigee and about 33,000 miles apogee with a period of about 17 hours.

8:35 a.m. EST
Failed.
Contact lost
after 2d Stage
burnout

The major objective of the satellite is to provide an analysis of the energies of the electrons and protons present in the Van Allen belts over an extended period of time. The Van Allen belts, discovered in 1958 by Dr. James A. Van Allen of the State University of Iowa, extend from 500 miles to many thousands of miles above the earth's surface and consist of charged particles which are trapped and guided by magnetic lines of force.

Measurements of the extent of the belts and general level of the energy of the particles in these belts have been made by previous satellites. Their data have shown, however, that the belts are continually changing and fluctuating.

A widely accepted theory states that the charged particles trapped in the outer portion of the belts are emitted by the sun and travel toward the earth at some 1,000 miles per second arriving in one or two days. Near the earth, they are trapped by the earth's magnetic field and modify the radiation belts, produce magnetic storms and disrupt radio and communications.

The inner belts are believed to be filled by particles arising from the decay of cosmic radiation as it enters the earth's atmosphere.

Other theories of the origin and nature of the belts have been proposed and the data resulting from the detailed studies to be conducted with this satellite will be valuable in selecting the most applicable theory.

In addition, the understanding of fluctuations in the radiation energies in the Van Allen zones will lead to a great understanding of basic relationships between the earth and the sun.

The space probe, Pioneer IV, was launched in March, 1959, after a period of unusually intense solar and auroral activity. It detected ten times as many energetic particles in the belts as did Pioneer III which was launched during a period of relative solar inactivity the previous December. In October, 1959, Explorer VI encountered particle rates 5,000 times lower than those of Pioneer IV but after some solar activity several weeks later, its detector showed a return of particle population nearly to the Pioneer IV level.

The results of the earlier samplings of the ever-shifting energies in the Van Allen belts have convinced scientists of the importance of measuring the numbers of energetic particles over long periods of time and to tens of thousands of miles into space.

This radiation belt satellite will attempt a more detailed study of the energies of the belts than any yet attempted. Its five detectors are more complex than those flown before and are capable of separating the particles by type and by energy.

Particularly of interest will be the first measurement of very low energy particles. It is believed that there are tremendous numbers of these particles and that they may have a major role in producing geophysical effects.

In addition, scientists hope for new data on the emission of the charged particles from the sun to the vicinity of the earth.

Two high energy particle detectors are contained in the Pioneer V payload, launched March 11, 1960, and now traveling through space between the orbits of earth and Venus. Should these detectors note the passage of a cloud of energetic charged particles which would be expected to be emitted from the sun at the time of a solar disturbance, it would be of great interest to note whether the instruments in the radiation belt satellite detect the arrival of such particles in the vicinity of the radiation belts.

PAYLOAD

This payload resembles the cylindrical shape of Explorers I - IV satellites. It is modified by a box-like structure surrounding it to support the solar cell array.

The cylinder is about 21 inches long and seven inches in diameter. It fits into a rectangular box 12 inches square and nine inches high.

In orbit, the casing of the fourth stage rocket of the high speed upper stage cluster will remain attached to the satellite and will help serve as the antenna for transmitting data to earth.

In addition, because of the comparatively light weight of the payload, the third stage will go into orbit. The three burned-out scaled-down Sergeants in cluster will orbit with an apogee of about 1400 miles and a perigee of more than 200 miles.

Weights of the payload:

Instrument pack assembly	12.2 pounds
Solar cell box assembly	7.1 pounds
Instrument housing assembly	2.5 pounds
Smaller components	1.0 pounds
Instrumented satellite	22.8 pounds
Fourth stage casing	12.5 pounds
Total weight in orbit	35.3 pounds

RADIATION EXPERIMENTS -- The Physics Department of the State University of Iowa has provided a package of five radiation experiments weighing a total of 6.3 pounds. The package is nine inches high and 5½ inches in diameter and slips inside the cylindrical payload casing. It is a "plug-in" package, in that it can be slipped into the cylinder, screwed down, and plugged into the power supply and transmitter in less than 20 minutes.

The five detectors are as follows:

Detector A: With its companion Detector B, this device is designed to count very low energy particles -- the first in any satellite which can detect electrons below 20,000 electron volts.

Detector A consists of a flake of cadmium sulfide inside a lead shield which has a hole in one end. Baffles shield the flake from light to which it is also sensitive, but it is unshielded to energetic particles. A magnetic field across the hole prevents all electrons with energies of less than 200,000 electron volts from reaching the cadmium sulfide. So it counts all charged particles except electrons, primarily protons.

<u>Detector B:</u> This device works in tandem with Detector A. It is identical to Detector A except that it does not have a magnetic field to eliminate those electrons of less than 200,000 electron volts. Thus the difference between the signals of the two detectors gives a count of those electrons with energies of less than 200,000 electron volts and down to 20,000 electrons volts.

<u>Detector C:</u> This device is a Geiger tube detector similar to those flown in earlier Explorer and Pioneer payloads. The tube in this case is enclosed by a lead shield which has a small hole in it to permit the entrance of soft radiation. The shape of the hole and strength of a magnetic field across it allows only electrons having energies in the range of 40,000 to 90,000 electron volts to reach the Geiger counter.

<u>Detector D:</u> This detector uses a Geiger tube identical to that in Detector C, except that there is no hole in the shield so it will report penetration of high energy particles through the shield. It will provide new data for the absorption spectrum of the particles and will provide data for comparision with the counting rate of Detector C.

Detector E: This detector also is a Geiger counter but it is only lightly shielded so that it will provide information on moderately penetrating particles. It will reveal the general structure of the belts and their fluctuations so that attempts can be made to correlate the findings with solar and magnetic activity. In addition, since this detector is similar to those flown in previous satellites (Explorers I, III, IV, and VII), its data will be compared with that from the earlier experiments to demonstrate that it is functioning properly.

Three holes in the top of the instrument container lead into three detector assemblies -- Detectors A, B, and C. Detector D is shielded. Detector E -- which is unshielded -- extends from the top of the container in its own housing.

TEMPERATURE EXPERIMENT -- To continue compiling data on the temperature of satellites in space, ABMA has provided temperature sensors for this payload. Sensors are located to report both internal and external temperatures.

TELEMETRY EQUIPMENT -- Data will be reported to ground stations by a 300 milliwatt transmitter operating at 108.03 megacycles. It is capable of broadcasting five channels of information continuously.

The total power requirement for the instrumentation in the package is about 1¼ watts. This is supplied from almost two pounds of nickel cadmium batteries which are recharged by

1184 solar cells mounted on the box-like structure surrounding the cylindrical instrument package. The solar cells are covered with glass slides .006 of an inch thick to protect them from possible radiation damage.

The antenna is a dipole similar to those used in early Explorers, with the gap located between the instrument package and the fourth stage casing.

A built-in timer will automatically cut off the transmitter after one-year of operation.

LAUNCH VEHICLE

The launch vehicle is a Juno II. It consists of a modified Jupiter IRBM provided by ABMA, and a three-stage high speed cluster provided by the NASA Jet Propulsion Laboratory.

The Juno II stands 76 feet high and weighs about 60 tons including fuel. The fuel is high grade kerosene; the oxidizer is liquid oxygen. This will be its sixth firing:

1. December 6, 1958: Pioneer III space probe launched to 63,000 miles.

2. March 3, 1959: Pioneer IV probe launched into orbit around the sun.

3. July 16, 1959; Vehicle was destroyed about five seconds after launch when it tilted sharply in an attempt to launch heavy composite radiation satellite.

4. August 14, 1959: A 12-foot inflatable sphere payload failed to achieve orbit due to premature fuel depletion in booster and malfunction in attitude control system for upper stages.

5. October 13, 1959: Explorer VII heavy radiation satellite launched into orbit.

The three upper stages, mounted in a spin-tub assembly, are very similar to the upper stages of the Jupiter C rocket, the vehicle that launched the first U. S. satellite, Explorer I. The second stage is a hollow, circular grouping of 11 scaled-down solid fuel Sergeant rockets. A triangle of three similar rockets fitted inside the cylinder is the third stage. The fourth stage is a single motor fitted inside the third stage triangle. All of the upper stage rockets are about 42.5 inches long and six inches in diameter.

The upper stages rotate at a rate of 600 rpm. During the launch and first stage flight, the upper stage cluster, capped by the payload, is protected by an aerodynamic shroud which is released by explosive bolts and pushed aside by a lateral rocket prior to upper stage ignition.

The guidance system employed is the one used by Jupiter in establishing a high record of accuracy during previous firings. A platform stabilized by gyroscopes is oriented on the pad in a direction to obtain the desired orbit. Deviations from a precalculated trajectory, such as resulting from wind, are measured by acceleration devices, fed into the guidance computer, and trajectory corrections are automatically made by the control system. Steering is by the gimballed nozzle of the booster engine and, after engine cut off, by variable thrust air nozzles.

After booster engine cutoff, approximately three minutes after liftoff, explosive bolts separate the booster which is slowed and steered to one side by four small retro rockets to prevent interference with the upper stages.

Approximately 30 seconds after separation, the nose cone of the aerodynamic shroud is removed by explosive bolts and pushed aside by a small lateral rocket. The upper stages and the instrument compartment of the Juno II system then coast for about 4.9 minutes. During ascent to the apex, this coasting system, consisting of a nonrotating body with the rotating cluster acting like a huge gyro arranged on its forward end, is oriented according to a prescribed program by air nozzles of the spatial attitude control system.

The second stage ignites pulling the upper stage and payload assembly, spinning at 600 rpm, clear of the shroud. The second stage burns for six seconds, followed by a coasting period of two seconds. The third stage then ignites burning for an effective time of six seconds, followed by the fourth stage which also burns six seconds and injects the payload.

TRACKING

Resonsibility for tracking the radiation belt satellite and recording its scientific findings is by NASA Goddard Space Flight Center's Space Operations Control Center.

Initial tracking of the satellite to determine injection and orbital elements will be under supervision of ABMA. Microlock stations participating under ABMA direction are Aberdeen Project Ground, Md., under Ballistic Research Laboratories; Cape Canaveral, Fla., and Huntsville, Ala., operated by ABMA; Atlantic, N. C.; Bermuda; Fort Monmouth, N.J.; and Mayaquez, Puerto Rico, all operated by the Army Signal Corps. Tracking information from these stations is fed to the ABMA Evaluation Center, Huntsville.

Long term tracking and data acquisition is under direction of the NASA Space Operations Control Center. NASA minitract stations participating are Blossom Point, Md.; San Diego, Calif.; Santiago, Chile; Esselen Park, South Africa; Woomera, Australia, Quitu, Ecuador; Lima, Peru; and Antafagasta, Chile.

In addition, stations at South Point, Hawaii, and Singapore, under direction of the Space Technology Laboratories will participate.

RESPONSIBILITIES

This experiment is under the overall direction of the National Aeronautics and Space Administration. Headquarters direction is in the Office of Space Flight Programs, Dr. Abe Silverstein, Director. Project officer for NASA is Dr. Leslie Meredith.

VEHICLE -- The Jupiter IRBM first stage of this launch vehicle was designed and fabricated by Army Ballistic Missile Agency, Huntsville, Alabama. The Juno II was launched by ABMA's

Missile Firing Laboratory.

Major subcontractors include the Rocketdyne Division of North American Aviation, which furnishes the Jupiter's 150,000 pound thrust liquid engine, and the Ford Instrument Company, which manufactures the all-inertial guidance system employed by the Jupiter.

The high speed upper stage cluster was designed by the Jet Propulsion Laboratory. John Small is JPL project engineer. The cluster was built by Cooper Development Corporation of Monrovia, California.

PAYLOAD -- The radiation belt satellite was designed, assembled, and tested by the Development Operations Division of ABMA (which will become the George C. Marshall Space Flight Center when it is formally transferred to NASA on July 1, 1960). Director of the Division is Dr. Wernher von Braun. Leading role in preparation of the payload was by the Guidance and Control Laboratory.

The radiation belt experiments were designed and built by the Physics Department of the State University of Iowa, Dr. James A. Van Allen, Chairman. George H. Ludwig, graduate student in the Department, supervised construction of the payload.

Detectors A and B were designed and built by Graduate Student John Freeman. Detectors C and D were designed and built by Graduate Student Curt Laughlin. Don Enemark, a senior student, supervised assembly of the flight units and Carl McIlwain, research assistant in physics, assisted in design of the detectors.

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NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: Friday PM's
March 25, 1960

Release No. 60-150

NASA LABORATORY TEST OF SATELLITE MODEL RE-ENTRY SUCCEEDS

National Aeronautics and Space Administration scientists have succeeded in the laboratory in recovering a small test model after a simulated entry at earth satellite speed. The successful accomplishment is believed to be the first of its kind.

The achievement is significant because it gives a high degree of added confidence in United States technological ability to conquer the heating problem of recoverable satellites.

The satellite recovery experiment on a laboratory scale was accomplished at the NASA Ames Research Center, Moffett Field, California, on February 27. Since that date, NASA scientists have been analyzing the results of the test and continuing a series of related experiments.

Scene of the successful recovery was the Ames Atmosphere Entry Simulator, a laboratory device which has contributed valuable knowledge to solutions of the re-entry problem. The simulator consists of a special trumpet-shaped nozzle which accelerates a flow of high pressure air so that it duplicates accurately the way in which the Earth's atmosphere becomes thinner with increasing altitude. At the widest part of the nozzle, air thins to the very low densities typical of the region where re-entry flight begins. As the nozzle narrows, air density increases to match conditions at ever lower altitudes. A model flying through the simulator experiences the same changes in air density and velocity as an actual object re-entering the Earth's atmosphere.

The successfully-recovered satellite model flown through the simulator at the Ames Center was just under one-fourth inch in diameter and made of a plastic material. It was shaped similar to the blunt forward face of the Project Mercury capsule now being developed for NASA's manned space flight program. The test served to confirm the validity of the type of heat shield selected for Project Mercury by completing re-entry at more severe conditions than the capsule will experience.

A three-stage shock heated gun, using helium as the propellant gas, launched the model at 17,000 miles per hour. Burning gunpowder provided the launching energy through a series of shock waves inside the gun's three stages. The Ames Research Center gun uses the staging principle to launch models at higher speeds like staging is used in rocket launching vehicles. Both the gun and the simulator into which it fires were devised by NASA scientists of the Ames Center.

Optical instruments along the flight path of the satellite model recorded the luminous streak created as it plunged through the air in the simulator. (Meteors make similar streaks as they enter the Earth's atmosphere.) Spark shadowgraph pictures were taken to permit study of the shock wave and wake generated by the flying test object.

The recovered model was carefully weighed and analyzed to find out how much material was lost by vaporization at the extreme temperatures experienced ~~during re-entry flight~~. It was found that well under five percent of the plastic ablation material of which the model was made had been vaporized during flight. Peak temperatures near 20,000°F occurred in the air just ahead of the model during flight.

The successful satellite recovery test is part of a program in which NASA scientists are trying to reach ever higher speeds under laboratory test conditions. They are now hoping to duplicate in the laboratory speeds typical of spacecraft re-entries from lunar or planetary missions.

Like many NASA research projects, the February 27 test at the Ames Research Center was a team effort by a group of scientists and technicians who have been studying re-entry for many years. The Atmosphere Entry Simulator is a valuable laboratory device because it is economical and relatively simple to operate, and permits in-flight observations almost impossible to obtain for a full-scale actual re-entry.

- END -

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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March 25, 1960

RELEASE NO. 60-151

NASA TO NEGOTIATE ON SNAP-8 SYSTEM

The National Aeronautics and Space Administration will negotiate with Aerojet-General Corp. on a proposal to build SNAP-8, a nuclear electric power generating system for spacecraft.

Formal negotiations on a contract, which Aerojet estimates will cost about $8 million, will begin immediately. Aerojet, a division of General Tire & Rubber Co. of Akron, Ohio, was one of eight companies which submitted proposals on the system.

The SNAP-8 reactor itself is already under development by separate contract to Atomics International, a division of North American Aviation, Inc., from the Atomic Energy Commission. AEC, with responsibility for developing reactors, is working with NASA on nuclear power and propulsion systems for space applications.

The entire system should be ready for a flight in about five years. NASA has not yet let a contract for the spacecraft in which SNAP-8 would first fly.

NASA's bidder invitation called for equipment to convert heat from a nuclear reactor into electric power. The initial system would weigh about 1,500 pounds, including reactor and shielding.

SNAP stands for Systems for Nuclear Auxiliary Power. The 8 is an arbitrary designator to distinguish it from similar systems.

SNAP-8 would generate 30,000 watts -- enough electricity to operate 10 average homes -- and operate for at least a year in flight.

Major components of the system are: (1) a nuclear reactor and (2) a heat-to-electricity conversion system including a boiler, similar in principle to electric generating systems used by most cities. But instead of using coal to generate heat, SNAP-8 will use a reactor.

The reactor will heat a closed loop of liquid metal. This loop will pass through a boiler, through which a second loop containing mercury also will pass. Loop one will heat loop two, vaporizing the mercury. In turn, the vaporized mercury will drive a turbine powering a generator which will produce electricity.

After the mercury passes through the turbine it will be routed through a series of tubes forming a radiator several hundred square feet in area. The cooling effect will change the mercury from vapor back to liquid and then the mercury will continue through the closed loop under pressure to repeat the cycle.

The reactor will be shielded effectively to keep reactor radiation from damaging the system and the spacecraft around it.

The initial version could be boosted into a nominal 300-mile Earth orbit in a spacecraft weighing several tons. Then, with the spacecraft in orbit, the SNAP-8 electric generating system could be turned on. Eventually, a dual version of SNAP-8 using a single reactor and providing 60,000 watts, could be lofted in Saturn-boosted spacecraft weighing 15 tons or more.

END

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

HOLD FOR DELIVERY
Estimated at 2 p.m.
Monday, March 28, 1960

Statement by

Dr. T. Keith Glennan, Administrator

National Aeronautics and Space Administration

before the

NASA Authorization Subcommittee

of the

Senate Committee on Aeronautical and Space Sciences

March 28, 1960

* * *

Mr. Chairman and members of the Committee:

I want to thank you for this opportunity to present NASA's $915,000,000 budget appropriations request for Fiscal Year 1961 and to discuss with you the Nation's space exploration program.

As in the past, my associates will present, in any detail you may desire, the broad sweep of the significant and complex program for which this sum is required. I would like, with your indulgence, to deal briefly with several facets of our program which I think will be of interest to the Committee.

First, I want to state our position in comparison with that of the Soviet Union in the field of space exploration. To support our statements, we have prepared a frank assessment of U.S. - Soviet capabilities and accomplishments.

Second, I will delineate our "Ten Year Plan" with particular emphasis on the activities programmed for the early years of that plan. I speak of emphasis on the program of the next few years because research and development activities, by their very nature, do not permit of detailed planning extending over too great a span of time. But we can and do point out the long term objectives and indicate the path we intend to follow toward those objectives.

Finally, I will describe our funding requirements for the next fiscal year.

As we informed the Congress a year ago, we are unable, as of the present time, to match our competitor in the weight-lifting capability of launch vehicle systems. The reasons for this situation have been stated many times but may well be summarized again.

As you will remember, in the late 1940s the United States elected to continue and further develop the heavy bomber as the delivery system for nuclear weapons. The Soviet Union, having a different base on which to construct its defense position -- no heavy bomber force nor bases from which to stage intercontinental flights -- chose to build high-thrust rocket systems for ballistic missiles to perform this same task. Thus, they gained a five- to six-year head start in the concentrated research and development that ultimately led to the rockets used in ballistic missile systems. Further, at the time they made their decision on the size of their ballistic missile delivery systems they had to base them on the existing state of the art of warhead development -- and so chose a larger launching vehicle than was later selected by us. Our decision to develop rocket-propelled ballistic missile systems was made after nuclear warhead development had proceeded to the point where we could plan on smaller over-all systems to deliver the same punch.

While our rockets can carry a warhead to the desired target with accuracy in the same manner as the Soviet rockets can, their more powerful rockets have given them an early lead on attention-catching, spectacular flights in space.

Practically all of our launchings have employed the 150,000-pound-thrust Thor and Jupiter rockets. In only three experiments has the U.S. employed the higher thrust Atlas. And in no single case involving the use of any of these rockets as first stage boosters have we been able fully to exploit the thrust capability of the rocket. Even today, we must continue to use as upper stages in these systems rockets available from other programs which have been modified and adapted for that purpose.

Based on their substantially earlier start in the development of large rockets, Soviet scientists have had at their command a rocket which our scientists and engineers estimate is in the 600,000- to 800,000-pound-thrust range. They have spoken of multi-stage launch vehicles, and some of their mission accomplishments would indicate that they have used upper stages with these very powerful first stage rockets. Undoubtedly they are continuing to refine and optimize their present units while developing even more powerful rockets and launch vehicle systems.

This disparity in thrust enables the Soviet Union to undertake very difficult space missions, some of which are completely denied to us today. It is reasonable to assume that the Russians can move more rapidly from concept, to drawing board, to the construction and launching of payloads because they are not limited by the weight restrictions we are experiencing. I suspect, as I have said in previous testimony before the Congress, that they can avoid the time-consuming business of miniaturization, optimum packaging, and other weight-saving practices. Moreover, their ability to carry heavy payloads improves the probability of success in any particular experiment because they have adequate weight-carrying margins to permit the employment of redundancy or duplication in many elements of their guidance, control, and communications sub-systems.

Urgent and, I believe, effective efforts are being made, both by NASA and by the Department of Defense, to develop a family of launch vehicle systems that will correct this imbalance. This activity is basic to our continuing progress in both military and nonmilitary space experimentation. We are developing a small group of multi-purpose launch vehicles which, through repeated usage by NASA and Defense, should become very reliable systems. The family consists of the Scout, the Thor-Agena B, the Atlas-Agena B, the Atlas-Centaur, the Saturn, and the Nova vehicle concept which will ultimately be developed to utilize the 1,500,000-pound, single-chamber, F-1 engine now under development. Of these, all are NASA development responsibilities excepting only the Agena B stages to be used with Thor and Atlas rockets.

Estimating availability dates in a technology as complex as high-performance launch vehicle systems is an uncertain business, but NASA and Defense have scheduled initial launchings for these systems as follows:

<u>Scout</u> -- a relatively low-cost, utility vehicle, mid-1960.

<u>Thor-Agena B</u> -- by the Department of Defense, mid-1960.

(For the next year or so, NASA will use a less powerful interim vehicle in this general class, the Thor-Delta, scheduled for initial launch in April 1960.)

<u>Atlas-Agena B</u> -- by the Department of Defense, late 1960; by NASA in mid-1961.

<u>Atlas-Centaur</u> -- the first system to use liquid hydrogen as a fuel, in 1961.

<u>Saturn</u> -- if granted our full fiscal year 1961 budget request, we expect to meet the following schedule:

...Static test of eight-engine cluster, spring 1960.

...Launch of first stage with dummy upper stages, by summer of 1961.

...Launch of two-stage vehicle, fall of 1962.

...Launch of three-stage vehicle, late 1963.

...Launch of first operational vehicle, before the end of 1964.

Looking further down the road, and another billion plus dollars into the future, we expect to have the Nova vehicle, consisting of a cluster of F-1 engines, with total thrust of 6,000,000 to 12,000,000 pounds, sometime after 1965.

Now, in spite of this limitation in thrust, we have been accomplishing a great deal. We attempted to launch 19 earth satellites and one deep space experiment during calendar year 1959. Of these, NASA launched nine earth satellites and one deep space probe of which five satellites were successful. To make the record complete, the Department of Defense, in its Discoverer series of developmental satellites, launched six satellites into orbit in nine attempts, and failed in its attempt to launch a "Transit" navigation satellite experiment.

In that same period, calendar year 1959, the Soviet Union launched three highly successful deep space experiments.

From October 4, 1957 to the present, the score is as follows:

U.S. -- Fifteen satellites launched successfully, six of which are still in orbit. Two continue to provide valuable data to the world scientific community. They are Vanguard I and Explorer VII.

USSR -- Three satellites launched successfully, one of which is still in orbit -- Sputnik III.

U.S. -- Four deep space probes launched successfully, two of which achieved their objectives substantially -- Pioneers IV and V.

USSR -- Three deep space probes launched successfully, each of which appears to have achieved its principal objective. One is in orbit about the sun; a second continues in a highly elliptical orbit about the earth; the third was demolished in a hard landing on the moon.

It is important to note that no Soviet failures have been reported. Secrecy has surrounded all of their launchings.

A comparison of the results obtained in the two programs makes clear the preponderance of spectacular "firsts" achieved by the Soviet Union, while our own program has yielded less spectacular, but on the whole equally or more significant, scientific results. Dr. Homer Newell, Deputy Director of NASA's Office of Space Flight Programs, has prepared, within the last few months, an evaluation of U.S. and USSR progress which is as objective an analysis as I believe now exists. While it is too lengthy for me to read here, I would like to suggest, Mr. Chairman, that it be inserted in the record as an appendix to my statement.

I would now like to turn to the long term objectives of our national program of space exploration which we have embodied in a Ten Year Plan.

The first chart outlines the anticipated growth in spacecraft weight from year to year. Spacecraft, incidentally, is a new term that we apply to that part of the vehicle which is to be placed into an earth orbit or on a departure trajectory from the earth. The term includes the propulsion, attitude controls, and guidance units for maneuvering the spacecraft as well as the instrumentation for the experiments to be undertaken.

For comparative purposes, the chart measures spacecraft weight that can be projected into a low altitude earth orbit of about 300 miles.

In the early years our increasing capabilities will come about through use of the Thor-Agena B, Atlas-Agena B, and Atlas-Centaur.

In the 1963-67 time period, the Saturn first stage and successively improved upper stages of liquid hydrogen-liquid oxygen will account for our increased capability.

I would now like to consider our projected launch schedule which is illustrated in the next chart.

You will note that by fiscal year 1962 and beyond, the present variety of first stage launch vehicle types will be reduced to one solid propellant rocket, the Scout, and three liquid propellant rockets -- the Thor, Atlas, and Saturn. Through restriction of vehicle types, and more intensive experience with each, we expect to achieve long-needed reliability.

Beyond Saturn, the use of chemical fuels would lead us, as I have said earlier, to a vehicle concept known as Nova, with four to six times the Saturn thrust based upon use of the F-1 engine. Depending on funding levels, development testing on Nova would occur in the post-1965 time period.

It should be noted that, together with the Atomic Energy Commission, we will be developing nuclear rocket systems which promise substantial advantages for particular missions involving heavy payloads. This program is moving solidly ahead and will be discussed by others later in these presentations.

The next chart deals with NASA's mission target dates. This listing has been developed to reflect the probable pace of technological advance during the next several years, it being assumed that funding necessary to maintain this pace will be made available. You will note that in the current year we are initiating tests of several vehicle development programs as well as the first orbital experiments in meteorology and communications. Also included are the first sub-orbital flights of the astronauts later this year.

In calendar year 1961 we will be working toward the launching of an advanced lunar impact vehicle and initiation of Centaur flight tests. If all goes as planned in Project Mercury, the first manned orbital flight will take place late in calendar 1961.

From this point on, the major milestones in the Ten Year Plan include a comprehensive program of exploration of the moon and the nearby planets, and development of the Saturn vehicle to provide preliminary data leading toward manned circumlunar flight in the early years of the next decade.

Such are the major objectives of NASA as we now see them. We are concentrating upon lunar experiments during this period for many reasons: first, the moon is an object of great scientific interest; it may hold many keys to the origin of the earth; secondly, ~~Furthermore,~~ success in the lunar program will provide us with the experience to attempt flights to the planets later on. ~~-- probably in 1962.~~ In short, we will be able to perfect our communications, guidance, and propulsion systems using lunar flight as a development tool.

In viewing this chart, I think it necessary again to point out that in the research and development business it is dangerous, if not foolhardy, to pinpoint dates for particular achievements too far into the future. Long-range objectives can and have been set. In the early years of the decade we suggest dates by which technological progress should permit us to attain particular objectives. This plan will be up-dated annually to serve as the guide for our programming activities.

The Ten Year Plan I have discussed so briefly will call for somewhat more than one billion dollars in Fiscal Year 1962 and upwards of one and one half billion dollars annually within the next five years. It is probable that this activity, if carried out with consistency and determination, will involve the expenditure of at least 12 to 15 billion dollars in the next decade.

One of the characteristics of research and development activities in any field is that useful and productive work cannot be expected if the support is provided on a start-stop basis.

Fluctuations between great extremes result in good people leaving the program. It is extremely important that we develop an imaginative, technologically sound program which can be supported on its merits as one promising real values -- not necessarily immediately important in an economic sense -- but promising real values in the on-going development of man, his society, and this Nation. We believe we have developed such a program.

I would now like to discuss with you the principal items in the Fiscal Year 1961 budget appropriations request. Our two highest priority subjects -- Saturn and Mercury -- account for a considerable portion of the increase over 1960. Both enjoy a DX priority rating.

With the acquisition of the Marshall Space Flight Center under the direction of Dr. von Braun, we have begun an acceleration of the Saturn project. The fiscal 1961 request allots a total of $230,000,000 for the super booster. With this requested funding we will advance the booster's completion by one year, give or take a month. As I have said, we expect to launch the first operational Saturn before the end of 1964. At earlier dates, useful flights may well be made. I doubt that the Soviet Union will exceed us in thrust capability after that time.

The Research and Development segment of the fiscal 1961 request accounts for $621,453,000. Of this item, we allot $134,308,000 for Saturn. (The remaining $95,692,000 earmarked for the project is carried in the Construction and Equipment and Salaries and Expenses budget categories.)

We are nearly doubling the funds for the F-1 engine -- from $24,200,000 in fiscal 1960 to $41,000,000 in fiscal 1961.

Turning now to Project Mercury. As I indicated earlier, we plan to launch an astronaut on the first of numerous ballistic training flights down the Atlantic Missile Range from Cape Canaveral later this year. In a Mercury capsule launched by a Redstone rocket, the astronaut will experience five minutes of weightlessness, reach an altitude of 120 miles and a distance of 200 miles during his 13-minute flight. During the next two to three years 20-odd testing, training, and orbital flights are scheduled in Project Mercury.

As you well know, the compressed time-phasing of Project Mercury has made it necessary to undertake research, development, design, and fabrication simultaneously. Hence modifications to design, arrangement, and structure must be made during the conduct of the program. Efforts to make the Mercury system as safe as humanly possible have inevitably added to the cost. The project will require $107,750,000 in R & D funds alone in the fiscal 1961 request.

Our scientific investigations in space -- sounding rockets, satellites, and space probes -- will account for $94,700,000. Space propulsion technology, which encompasses research and advanced development on solid and liquid rockets, nuclear systems technology and space power technology is allotted $83,800,000.

The C & E portion of the request totals $122,787,000. This appropriation provides for the modernization of existing facilities and the purchase of major equipment items.

The three major items in this category are: $27,750,000 for the Mercury, Minitrack and Deep Space tracking networks; $26,750,000 for the George C. Marshall Space Flight Center at Huntsville, including construction of a second static test stand facility for Saturn; and $27,750,000 for a new Saturn launching complex at AMR and other necessary facilities.

Improvements at Langley, Ames, Lewis, Goddard, the Jet Propulsion Laboratory, and Wallops Island account for the balance of the funds.

Finally, the S & E item has grown from $91,400,000 in fiscal 1960 to $170,760,000 in fiscal 1961. About 75 percent of this increase is required for the first full year funding of the 5,500-man staff at the Marshall Center.

We also plan to increase the staff at Goddard from 1,214 to 2,000 persons and at Wallops from 225 to 300 individuals. Our remaining research centers -- Ames, Lewis, Langley -- will maintain their present staffing levels.

This, of course, has been a very general review of the fiscal 1961 request. I would be remiss if I did not acknowledge the very great support and encouragement given to me and to NASA by the Chairman and the members of this Committee. You may be sure that we are sparing no efforts to continue to deserve the faith you have thus far shown. More successes of the Pioneer V type will provide proof of the validity of that faith -- and we confidently expect to have more such spectacularly successful flights. It is my strongly held opinion that the program my associates will outline for you deserves your approbation.

Thank you for your courteous attention -- and now I await your pleasure before Dr. Dryden discusses our international activities, results of past launchings, and the schedule for the coming year.

No. 60-155

California Institute of Technology

Jet Propulsion Laboratory

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FOR RELEASE ON DELIVERY

Approximately 10:00 A.M.

Wednesday, March 30, 1960

Statement by Dr. William H. Pickering, Director, California Institute of Technology Jet Propulsion Laboratory, March 30, 1960, to the House Committee on Science and Astronautics.

Mr. Chairman and members of the Committee:

I am grateful for this opportunity to discuss with this Committee the changes proposed to be made in the Space Act of 1958. I do not think I am overstating the case when I say that satisfactory solutions to some of the problems facing us in this area are central to the welfare of this country. We must recognize that the United States is firmly engaged in a space program. We are in space and will be for years to come. Certainly the actions we take now and in the next few years will have an ever widening effect on the character of the program the United States pursues in the exploration of the universe.

It seems to me that such problems as exist stem from a complex of causes. First, there is the fact that the U.S. space program is not simply a scientific undertaking to explore space. It has an importance that exceeds the scientific motivation, and indeed we have seen recently that our space program is becoming an instrument of national policy.

Secondly, the space program is being conducted by two agencies, the National Aeronautics and Space Administration and the Department of Defense. Each agency has clearly stated roles, one in the military application and the other in the scientific-Cold War application. Yet, there is some evidence that the two agencies do not fully agree on their respective roles.

Finally, the space program is enormously expensive. Having said this, it is transparent that duplication of effort, waste of talent and resources and marginal programs cannot be tolerated. In this costly new field, with a wide variety of exciting and tempting tasks to perform, one must exercise great moderation to choose and pick within the framework of our ability at the moment, so that a relatively few assignments are performed well. The alternative, of course, is that a great number of tasks are performed poorly.

Part of the misunderstanding relating to the space program, it seems to me, stems from a larger problem. This is the increasing importance of the role of technology in U.S. policy making. When we associate science and government, there is a tendency to assume that when we say science we mean military science. There are quite logical reasons for this misunderstanding, but it is important to point out that in these days of the Cold War propaganda, non military science and technology may indeed be as important to the government as military science. I am not saying, of course, that this is an either/or choice; that one must choose non military science in place of the military technology, or vice versa. I am saying that in some of the concern expressed over the space program, we have tended to overlook the value of non military applications.

As a consequence, governmental support of certain scientific and technological activities outside of the Department of Defense may, and indeed, has assumed a major significance. The establishment of the National Aeronautics and Space Administration is an example of the willingness of the government to embark upon a major non-military scientific program.

However, in view of the long history of support of scientific research by the Department of Defense, it is evident that problems may arise if extensive programs are established outside of the Department of Defense, particularly if these programs appear to impinge on the military field.

The Department of Defense indeed can claim credit for sponsoring a major part of our technological advances in the past decade, but on a long term basis it appears to me that we should now try to agree on the value of government support of non military science and technology. When such an agreement is reached, clearly a mechanism to express such support must be developed.

At the present time, of course, the major agencies conducting such work with government support are the National Science Foundation, the National Aeronautics and Space Administration and the National Institute of Health. The Atomic Energy Commission is in a special category since it has a charter calling for "the maximum contribution to the general welfare, subject at all times to the paramount objective of making the maximum contribution to the common defense and security." Consequently, the AEC serves both a military and non-military function.

Some critics of the space program as it stands today have suggested that it should be established under an AEC-type organization. This indeed would serve the purpose of unifying both civilian and military factors in the program, but in view of the large and valuable experience pool existing in the Air Force, it does not seem reasonable to attempt to transfer this capability to another organization. Therefore, I do not believe that the solution to the problem is to extend the charter of the NASA into an AEC-type organization.

In considering possible changes in the Space Act, it seems to me that we should start with an assumption that no major organizational changes should be made. The progress that has been made in the past year, and the status of working plans for the future combines to suggest that the present organization is entirely capable of performing its assignment. To me, the achievement of Dr. Glennan and his staff in organizing, on the run in a new field, in getting together a bold imaginative program in less than two years, is one of the triumphs of men over circumstance. Any major changes in this organization would do nothing but harm.

Consequently, I conclude that the objective of any change should be to assure better working relationships between the NASA and the Department of Defense so that each is free to pursue its own assignments. For example, the abilities and interests of the Department of Defense should be utilized fully, but this should be done through a clear understanding of national goals and a national space program, followed by an assignment of responsibilities in all major areas which is consistent with the interest and ability of the group concerned.

The fundamental distinction between civilian and military objectives should be clear. Among other things, it is clear that the responsibilities for frontier type developments, and for research and development, must continue for the forseeable future to rest with NASA. The problem is to determine the relative proportion of our resources which should be devoted to each area. If this could be agreed upon, I would expect no major difficulties. There is no problem of supporting a major in-house space capability in the Air Force. With the transfer to the NASA of the Development Operations Division of the Army Ballistic Missile Agency and the Jet Propulsion Laboratory, the large government supported space laboratories are now within the NASA.

In order to arrive at a proper national space program, I do feel that a formal coordinating mechanism between military and civilian planning is required. Dr. Glennan has pointed out that effective coordination between the two groups can occur only if there is a close relationship at all working levels. And, I could add, if there is a real desire for coordination. In this I concur, with the added stipulation that such coordination must occur also at the program planning level.

To bring this high level coordination about, I believe it will be necessary to take action above that which the revision of the Space Act suggests.

Undoubtedly, a number of solutions are feasible. One possibility would be for deputies of both the NASA Administrator and the Secretary of Defense to be co-chairmen of a small planning group which establishes programs within policy guidelines laid down by the President. The actual solution is perhaps a matter for Executive action, but the Congress should assure itself that the total national program indeed is coordinated as the spirit of the Space Act demands.

In conclusion, please allow me to express to the members of this Committee, and through you to the Congress, my thanks for the fine support and understanding you have given the national space program. Thank you.